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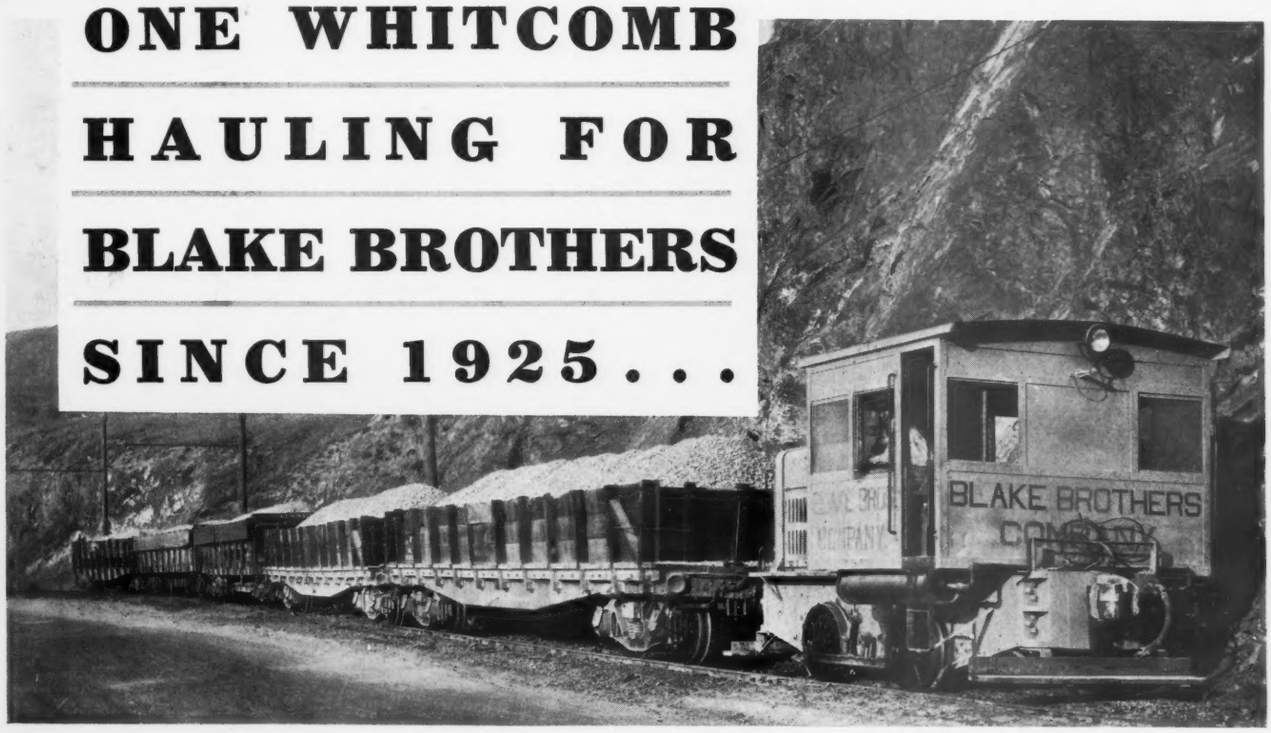
The First Paper Devoted to the Production of Non-Metallic Minerals

XXIII | OCTOBER 7, 1931 | No. 1

ONE WHITCOMB HAULING FOR BLAKE BROTHERS SINCE 1925 . . .



To take an 80-ton loaded gondola car around a 40° curve and up a 3% grade is just one of the tough jobs of hauling to be done in the quarry of Blake Brothers Company, San Francisco.

For approximately seven years one 20-ton Whitcomb Locomotive has been doing every hauling and switching job at Blake Brothers' quarry. This includes moving twenty empty gondola cars in and twenty loaded cars out per day, covering a half mile main line to the wharf, and doing all switching and spotting for loading and dumping.

This owner grinds valves, takes up bearings and looks at piston rings once a year. Outside of that there have been few repairs.

Blake Brothers' Whitcomb consumes about 3 gallons of gasoline per hour. "Oil consumption is very low, but due to extremely dusty working conditions it is changed once a month; very little is used between times."

There is a type and size of Whitcomb for efficient, dependable and economical hauling on any project.

THE WHITCOMB LOCOMOTIVE COMPANY

ROCHELLE - - ILLINOIS

SINCE SEPT. 11, 1929, LARGEST NET PAID CIRCULATION IN THE FIELD
(See A. B. C. Audit Reports for Details)

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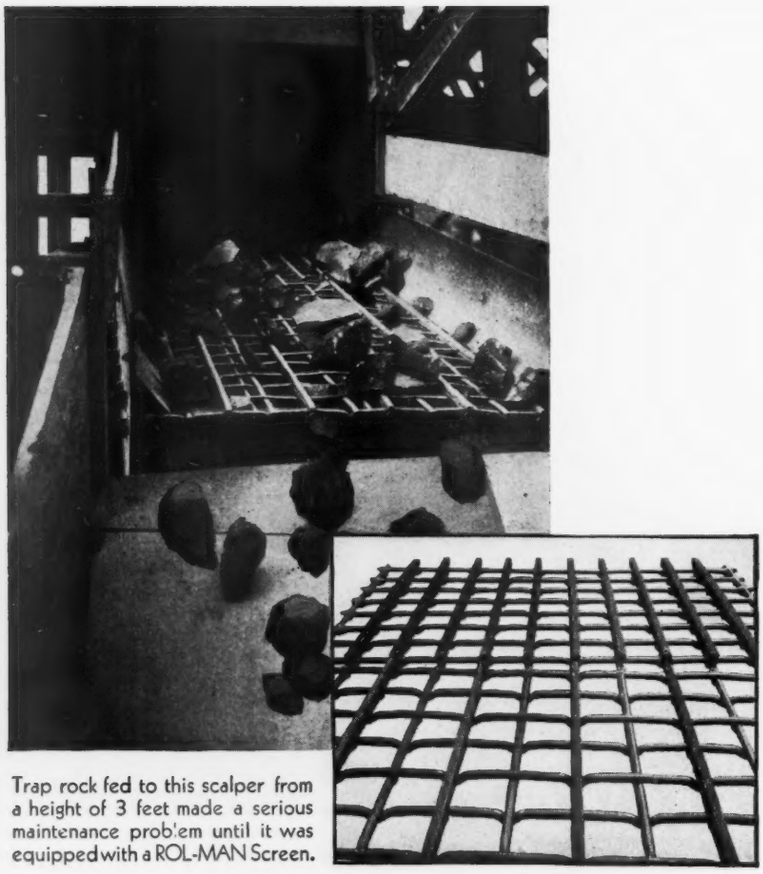

Trap rock fed to this scalper from a height of 3 feet made a serious maintenance prob'em until it was equipped with a ROL-MAN Screen.

Close-up of special ROL-MAN ribbed screen cloth, showing bars welded on top of the lengthwise rods of upper and lower panels.

. . . Perhaps You Have a Screen Cloth Problem

It may be similar to the one illustrated above, which involved a scalping screen handling trap rock under conditions of very severe abrasion and impact. The original screen cloth lasted only one week. Replacement costs were a serious problem, to say nothing about the labor of changing or the interruptions to plant operation . . . The proposition was placed before ROL-MAN engineers, who designed a screen consisting of two special panels of Double-Lock Mesh Manganese-Steel Screen Cloth. The panels are provided with manganese-steel bars welded to the screen surface, the bars being placed directly on top of the lengthwise rods . . .These bars, or ribs, bear the brunt of the excessive abrasion and impact. They also skid off the heavy oversizes quickly. This gives the smaller material free access to the openings, thereby increasing production . . . On account of the great wear-resisting qualities of the true manganese steel, these screens have many times longer life, thus reducing the frequency of replacement and the cost of maintenance to the very minimum . . . If you are having difficulty or desire to cut the cost of screen cloth on revolving, vibrating or inclined-gravity equipment, it is suggested that you get in touch with the nearest branch office listed below. Bulletins on request.

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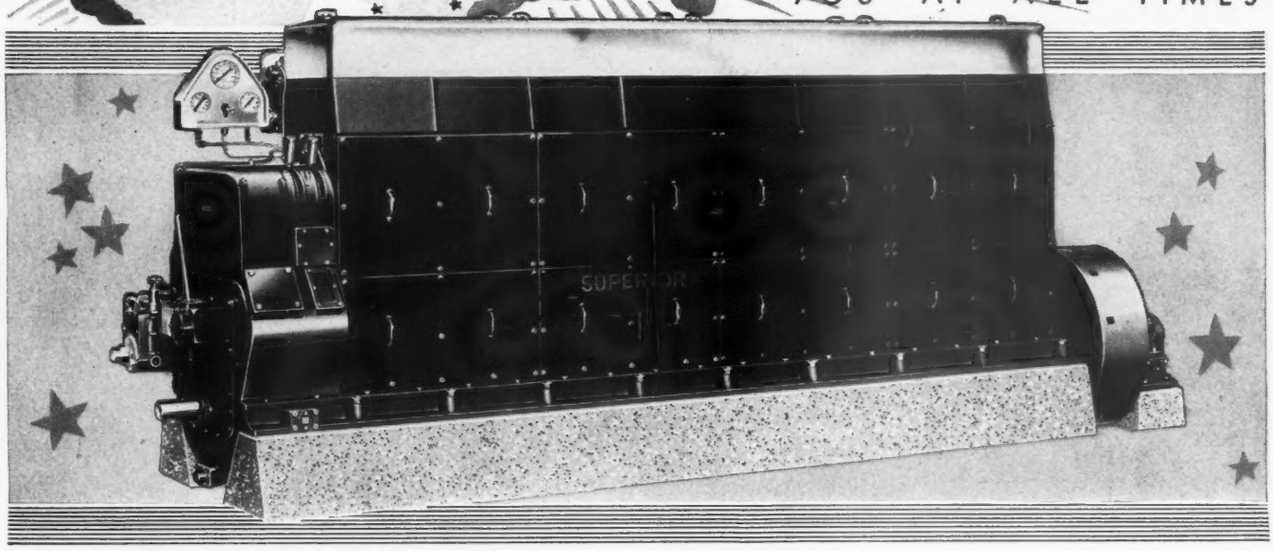

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» *Bulletin No. 120 giving complete information sent on request* «

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SPRINGFIELD, OHIO

Pit and Quarry

With which is consolidated CEMENT-MILL & QUARRY

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Vol. XXIII CHICAGO, OCTOBER 7, 1931 No. 1

Hercule Co. Acquires Volo's Cement Plant

NOW LARGEST GREEK PRODUCER

The recently-issued report of the Société Generale des Ciments Hercule S. A., Greece, for the fiscal year 1930, shows net earnings of 13,400,000 drachmas ($2,586,200), according to *Zement*. Since the acquisition of the Société Anonyme des Ciments de Volo Olympos just recently the Hercule company possesses two modern cement plants, one in Piræus and one in Volo. That in Piræus is equipped with two up-to-date rotary kilns and has a yearly capacity of 70,000 to 80,000 metric tons (68,880 to 78,720 long tons); it is thus the largest cement factory in Greece. The equipment of the Volo plant consists of one rotary kiln with a yearly output of 30,000 to 35,000 metric tons (29,520 to 34,440 long tons).

In this connection it is interesting to observe that last year the Greek cement industry produced altogether 180,000 metric (177,120 long) tons of cement, with a valuation of 171,000,000 drachmas ($33,003,000), while the total production of the preceding year was 155,000 metric (152,520 long) tons. Since the year 1923, in which only 36,000 metric (35,464 long) tons of cement were produced, the Greek output has been steadily and rapidly increasing.

Gravel Plant at Hoover Dam Will Cost $250,000

Plans are being prepared for the erection of the sand-and-gravel plant near Boulder City, Nev., by Six Companies, Inc., contractors at the Hoover Dam. The plant will cost about $250,000, it is reported, and will supply the aggregates for the concrete to be used in the dam.

Asks $15,000 Reparation for High Cement Rates

Freight rates on cement, in carloads, from North Birmingham, Ala., to points in Central Freight Assn. and New England territories have been attacked by the Southern Cement Co. in a formal complaint filed with the Interstate Commerce Commission. In addition, reparation on past shipments amounting to $15,000 is asked.

The complaint said the Southern Cement Co. was "shipping, or trying to ship, rates permitting," cement from North Birmingham to the Middle West, East and New England. However, under the present rate adjustment, it was said, great difficulty is experienced in attempting to meet competition from cement mills located in those territories.

The present rates on cement from North Birmingham to the territories mentioned are alleged to be unjust and unreasonable.

Marquette Cement Gets 300,000-Barrel Contract

The Marquette Cement Manufacturing Co. has closed contracts with the Moulding-Brownell Corp. of Chicago for the furnishing of all of the Portland cement required for the construction of the new postoffice building and the Marshall Field office building. Some 300,000 barrels of cement will be used in the construction of these two Chicago structures.

Coast Guardsmen Save Gravel Barge in Storm

The Grand Haven, Mich., coast-guard crew under Capt. William Preston saved a gravel barge from certain destruction on the beach near Grand Haven recently when heavy seas in Lake Michigan broke the barge loose from the tug *Sennece* owned by the Tom Johnston Gravel Co., of Grand Haven.

Upon losing its connection with the tug the barge floated toward shore. The coast guards saw the plight of the barge and the crew set out from the shore and saved the ship.

Refractories Institute to Convene October 8-9

The American Refractories Institute will hold its regular fall meeting on October 8-9, in the Hotel Cleveland, Cleveland, O.

Only committee meetings will be held on October 8, the technical papers and discussions having been scheduled for October 9. Among the speakers will be D. B. Hendryx, chief engineer, Harbison-Walker Refractories Co., and S. M. Kier, vice-president, General Refractories Co.

Rock-Asphalt Plants Planned in Missouri

REVIVAL OF INDUSTRY SEEN

The rock-asphalt industry in western Missouri seems to be taking a new lease of life after many ups and downs. Already one new plant is in operation and several others are under construction or in prospect.

John Pratt of Nevada, Mo., is the owner of the new plant which recently went into operation in that city. The deposit of rock asphalt is south of Deerfield, Mo., and about 15 miles southwest of Nevada. Loading is now being done by hand into trucks although a shovel will later be used. The material is an impregnated sandstone with a 3 per cent. bitumen content.

The trucks discharge at the plant to a United Iron Works Co. jaw crusher for primary reduction. A belt bucket elevator feeds to a Gruendler pulverizer for final reduction. A second elevator feeds the pulverized material to storage. A portable hot-mix asphalt plant is used to add sufficient bitumen and mix the material. I. L. La Masney is in charge of plant operations.

Ohio Quarry to Produce Stone-Sand from Waste

W. J. Sprow of the Wagner Quarries Co., of Sandusky, O., has returned from Milwaukee where he closed contracts for the purchase of machinery from the Allis-Chalmers Manufacturing Co., and which will be delivered to Sandusky shortly and placed in operation at the Wagner plant.

The equipment will be used in the manufacture of sharp sand, made from waste products at the quarry.

Production of stone-sand will enable the company to utilize much of its waste material and at the same time provide a product that has growing sales possibilities.

North Carolina Marble Quarry Plans Expansion

Carolina Marble Quarries, Asheville, N. C., is planning an expansion and improvement program, including a one-story cutting and finishing plant, quarry equipment, etc., to cost over $35,000.

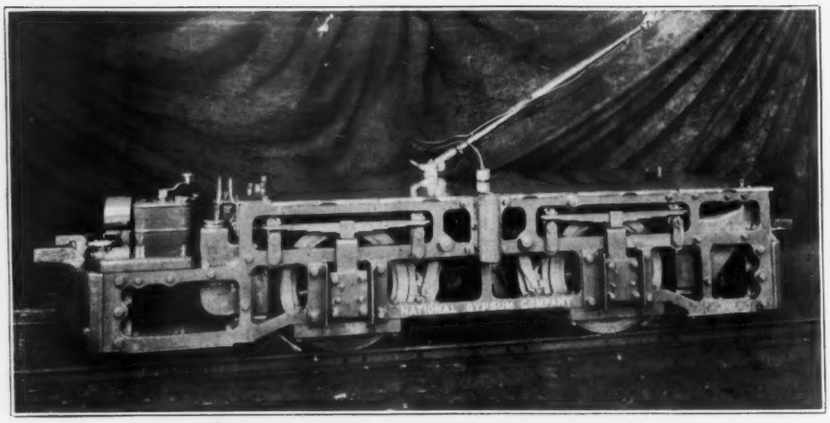
Gypsum Mine Installs Electric Locomotive

FACILITATES ROCK HAULAGE

To facilitate the haulage of gypsum rock from working faces in the mine to the shaft with greater dispatch and improved economy, the National Gypsum Co., in its mine near Buffalo, N. Y., has installed an 8-ton Baldwin-Westinghouse 250-volt trolley locomotive. This locomotive has an overall length of 12 ft. 3½ in., excluding bumpers, an overall width of 63 in., and an overall height of 36 in. The locomotive is equipped with 250-volt motors, controlled from a series-parallel dynamic braking controller. Two trolley sockets are located on each side frame. The side frames of the locomotive are of bar steel and the driving springs are of the leaf type. The open construction of the side frames greatly facilitates general inspection and adjustment of the brake shoes. The bumpers are of cast steel with climbing lugs cast integral and four multiple coupling sockets at 3 in. centers.

Power will be supplied to the haulage system from a 100 kw. synchronous motor generator set, through an incoming line panel and d-c. generator panel to the overhead trolley and ground return with welded track bonds.

All electrical equipment, line material, etc., for the electrification was supplied by the Westinghouse Electric & Manufacturing Co.



Electric locomotive in National Gypsum Co. mine.

Marquette Cement Will Spend $250,000 on Kilns

The Marquette Cement Manufacturing Co. has announced plans for the installation of new equipment at its Oglesby, Ill., plant to increase the efficiency of the rotary kilns. Approximately $250,000 will be spent in the improvement, it is reported. Work on the changes is expected to start late this autumn.

Lone Star Texas Lands 50,000-Barrel Contract

An order for 50,000 barrels of cement has been placed by the Panama Railroad with Lone Star Cement Co., of Houston, Texas, subsidiary of the International Cement Corp.

Concrete-Road Building Discussed by Institute

The Concrete Reinforcing Steel Institute held its semi-annual meeting at Shawnee-on-Delaware, Pa., Sept. 28 to 30. The first day's program was featured by an address by the president, an address entitled "Let Us Look Ahead," by Dr. Stephen I. Miller, executive manager, National Assn. of Credit Men, and a summary of recent promotional activities by the institute engineer. The second day was devoted to a series of 10 minute talks on conditions in representative cities, regional conferences, and a banquet. Reports of the forms department, a proposal for further standardization in areas of spiral rods, and road-building developments were discussed in the final session on Sept. 30.

Slag-Crushing Plant to Be Built at Birmingham

J. D. Roquemore of Montgomery, Ala., president of the Roquemore Gravel Co., and the Alabama Sand & Gravel Co., is erecting a crushing and screening plant which will utilize a slag deposit near the plant of the Pullman Car & Manufacturing Co. The new plant will have a capacity of 50 cars per day and operations were scheduled to start late in September.

Calaveras Cement Steps Up Rate of Production

Quarrying of limestone and shale on the property of the Calavaras Cement Co., south of San Andreas, Cal., which has been partially suspended for several months, has been speeded up, and the production of cement has been increased to 3,000 bbl. daily. The present capacity of the plant is 4,000 bbl. per day.

Begins Gravel Delivery on California Contract

Rebuilding of the plant of the Stony Creek Gravel Co. at Orland, Cal., has been completed, and the company is now making deliveries of gravel on a 1,500 car-load contract recently received from the California State Highway Department.

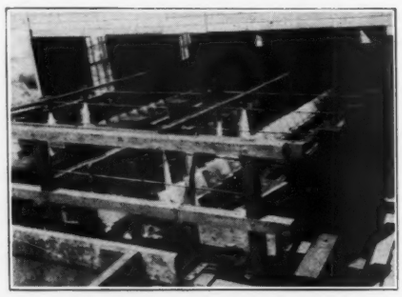
A new drag-line was included in the improvements.

To Supply 500 Carloads of Stone for Postoffice

The Ingalls Stone Co., whose quarries are located at Bedford, Ind., has received the contract for supplying the dimension limestone for constructing Chicago's new post office. About 500 carloads of material will be used.

Indiana Gravel Producer Adds Steel Log Washers

The Interstate Sand & Gravel Co., operating a gravel plant at Covington, Ind., recently installed some new equipment for washing its products. Previous to this installation there had been occasional rejections of material but since then no complaints have been received and the material has been entirely satisfactory. The new washing equipment consists of two pairs of McLanahan steel log washers. The plant has a capacity of 1,000 tons per day.



Log washers handling gravel at the Interstate Sand & Gravel Co. plant.

Draws Plans for Clinker-Grinding Plant in Texas

The National Portland Cement Co. of Dallas, Tex., is reported to have sketched plans for its proposed $50,000 clinker-grinding plant to be built in the vicinity of Baytown, Tex. Raw material will be shipped by water from the company's plant at Chubbock, Cal.

New York State Builds Record Highway Mileage

A new record for highway construction in New York state has been set this season, the Department of Public Works reports. Up to September 15, 744.31 miles of road were built, as compared with 551 miles in 1930.

Electric Limestone Now Located in Spivey Bldg.

The Illinois Electric Limestone Co. has announced the removal of its offices to 1009 Spivey Bldg., located at 417 Missouri Ave., East St. Louis, Ill.

Concrete Paving for 8 Months Hits Peak

TOTAL HITS 95,414,767 SQ. YD.

Concrete pavement awards during August totaled 7,674,699 sq. yd., against 12,469,571 in July, and 10,656,968 in August, 1930, according to the Portland Cement Assn.

Highway awards aggregated 5,437,434 sq. yd., against 9,309,088 in July, and 7,242,839 a year ago. Street and alley awards were 2,237,265 sq. yd. against 3,170,483 in the previous month, and 3,414,129 in the corresponding 1930 month.

While this indicates an apparent decline in the amount of concrete-pavement awards, the decrease in August was caused by the letting of highway work early this year to provide as much 1931 construction as possible. The association's highway-and-municipal bureau has estimated that yardage awarded to date represents approximately 77 per cent. of the total which may be looked for this year.

August figures brought highway pavement awards for the eight months to the record total of 95,414,767 sq. yd., which represents an increase of better than 12 per cent. over highway awards of 84,954,327 sq. yd. in the first eight months of 1930, which was the best preceding year in this respect.

This substantial increase in highway awards was offset partly by an eight-months' decrease in street and alley awards to 16,637,975 sq. yd. from 25,938,975 in the eight months ended August 30, 1930. Despite the decrease in August, total awards of 112,052,742 sq. yd. for the eight months still were 1,159,440 sq. yd., or 1.0 per cent. above awards of 110,893,302 sq. yd. in the corresponding 1930 period.

Of $6,000,000,000 worth of contemplated public construction reported to the President's committee last November, only about one-third has been let to contract as yet, the association reports. Of the remainder, it is estimated that about half is available for immediate award if steps are taken to cut through red tape and release the work.

Oppose Higher Rates on Silica Sand in Box-Cars

A plea that the Interstate Commerce Commission reopen Docket 17,000—Parts 11 and 11-A, in so far as it involves rates on sand between various points in the United States, has been filed with the commission by southwestern glass manufacturers.

The petition specifically hits the commission's finding that a higher basis of rates should apply on silica sand when loaded in box-cars. This finding, the petition said, will result in freight-rate increases ranging from 1 to 50 per cent. and averaging 25 per cent.

"Although a general investigation instituted by the commission," the petition said, "there is not one suggestion; in fact, if the suggestion was voiced, every interest protested a different scale of rates in box-cars than in open-cars. . . . The trend of the report indicates that because this sand is to be used by a glass plant for the manufacture of glass in some instances, and because it is white and fine, it must pay a penalty."

The petitioners declared the commission's decision penalized silica sand for using box-car equipment. For that reason, it said, other commodities using box-cars should be similarly penalized, if the commission is to be consistent.

The glass companies filing the petition were Harding, Radiant, Witherspoon-Simpson, Baker Bros., Liberty, Victory Window Glass Co., Southwestern Sheet Glass Co., Okmulgee, Libby-Owens-Ford, George F. Collins & Co., Wichita Falls Window Glass Co., Okmulgee Chamber of Commerce, Three Rivers, Kerr Glass Mfg. Corp., Bartlett-Collins Co., Hazel-Atlas, Kerr, Hubbard & Kelly, Alexander H. Kerr & Co., and Pittsburgh Plate Glass Co.

Indian Burial Grounds Unearthed in Ohio Pit

Curiosity seekers have been overrunning the banks of the Wapakoneta Sand & Gravel Co. pit, near Wapakoneta, O., following the discovery of an Indian cemetery there recently.

School children by the scores eagerly watch the excavation work hoping that souvenirs will be unearthed as the excavation work progresses.

Attempts may be made to dig in the vicinity where four skulls were unearthed by workmen. The skulls are believed to be those of Indians because of the evidence of high cheek bones.

Leases 300-Acre Silica Tract Near Hot Springs

The Corona Silica Products Co. of Rogers, Ark., recently organized by H. R. McKnight and associates, has leased over 300 acres of silica and rutile properties in the Magnet Cove district, near Hot Springs National Park, Ark., and plans the installation of mining and ore-concentrating equipment to cost about $75,000. Loading, conveying and other equipment will be installed.

99-Car Gravel Shipment Sets Record for Plant

The Missouri Gravel Co. of La Grange, Mo., shipped ninety-nine cars of gravel the last day of August. This was said to be the biggest day's total in the history of the company's gravel business. The total number of cars shipped during the month of August was 1,595.

Credit Chief Urges Courageous Thinking

LEADERSHIP IS CHALLENGED

"This business depression has challenged leadership as never before and American business must lead the way courageously to an intelligent and non-political discussion of this important situation."

That is the view of Henry H. Heimann, newly - chosen executive manager of the National Assn. of Credit Men, who took office as successor to Dr. Stephen I. Miller on Sept. 1. Dr. Miller moved to an executive post in the R. G. Dun organization on that date.

"Courageous thinking and courageous leadership are the greatest needs of our country and of the world today," according to Mr. Heimann. "When the president announced the debt moratorium, a surge of confidence swept the country. This national feeling was only temporary for within a few weeks our buoyant spirit had vanished. Our people's faith in business leadership has been greatly weakened. A program that will lead the way to prosperity has not been adopted. The necessity of a final agreement on the treatment of war debts is obvious. The question of the length of the moratorium and the necessity of future international capital adjustments should be courageously met. It remains to be seen whether we have the courage to face the issue now or stumble along for a period of uncertainty until an eleventh-hour decision is again a necessity. There can be no question but that the majority of opinion is to the effect that a year's moratorium is simply a period of grace.

"Too great increase in plant capacity is another case in point. Many business articles tell us that it is a barrier to a return to prosperity. In certain industries it is true that plant capacity has far outrun possible needs, but it is likewise true that excess plant capacity will always exist. Alert management will be the first to inform you that reasonable excess plant capacity yields splendid earnings in times of peak demand."

This extra potential capacity can more than earn its keep in times of flush prosperity, says Mr. Heimann, so that it can pay for itself during depressed periods. Plant operators thus can fill orders at once without waiting for extra capacity to be added by building hurriedly in a time of high prices. Reasonable excess capacity is generally utilized at a satisfactory profit. Keen management has found it well worth the investment, for added production means added profits, since it is recognized that beyond a certain figure the ratio of profits to costs increases as more is produced.

General Reductions in Sand Rates Seen

UNIFORM SCALE PRESCRIBED

Prescription of a uniform distance scale of freight rates to be applied on industrial sand when moved within official classification territory has been recommended to the Interstate Commerce Commission by Examiner Burton Fuller in a proposed report on more than a score of formal cases involving freight rates on this commodity between various points in official territory. All the cases have been grouped together by Mr. Fuller as the "Industrial Sand Cases, 1930."

The distance scale suggested by the examiner for the commission's consideration applies to industrial sand, other than ground or pulverized. For this class of traffic it will result, generally, in reductions in rates. It will result, generally, in an increase in rates on other than ground or pulverized sand, if the commission adopts his recommendations. The recommendations, however, will result in reduced rates on industrial sand generally.

There were three separate scales recommended by Examiner Fuller to be applied on industrial sand, other than ground or pulverized, as follows:

Scale I, to apply on high-silica sand (containing not less than 95 per cent. silica) in open-top cars, and on core sand, in open-top cars, from origins west of a north-and-south line drawn through Cumberland, Md.; on other sand, in open-top cars, from Michigan City and Willow Creek, Ind., Bridgman, Sawyer, and Muskegon, Mich.; Barr, Bedford, Dundee, Geauga Lake, Massillon, Phalanx, and Warwick, Ohio, and Polk, Schollard, and Utica, Pa., and on gravel, in car-loads, from Phalanx.

Scale II, to apply on high-silica sand in open-top cars, and on core sand, in open-top cars, from origins on and east of a north-and-south line drawn through Cumberland, Md.

Scale III, to apply on molding (naturally-bonded) sand, in open-top cars and in box-cars, and on all other sand (except ground or pulverized sand) in box-cars.

For distances up to and including 15 mi. the Scale I and II rates are the same (60c. per net ton), but, generally speaking, for distances over 15 mi. and not over 700 mi. the Scale I rates are lowest, the Scale II rates higher, and Scale III rates highest.

The rates above 700 mi. are the same for each of the three scales, whether applied to single- or joint-line hauls. Joint rates for lesser distances than 700 mi. under Scales I and II are to be made by adding 20c. per net ton for distances up to 350 mi. and 10c. for distances of 351 to 700 mi., with the provision that the haul from Tatesville, Pa., to destinations on the Pennsylvania Railroad be considered as single-line.

Because of different transportation conditions within New England and the increased operating cost of the railroads in that territory, Mr. Fuller recommended a system of arbitraries over his suggested scale to be applied in New England. The arbitraries average about 25 per cent. higher than the scale for the remainder of official territory, ranging from 30c. per net ton to be added to hauls 50 mi. and under to 50c. for hauls over 220 mi.

He also recommended that the commission authorize the addition of an arbitrary not exceeding 70c. per net ton on traffic from origins in New York and New Jersey to destinations in New England through New York harbor to cover the increased cost of the harbor movement.

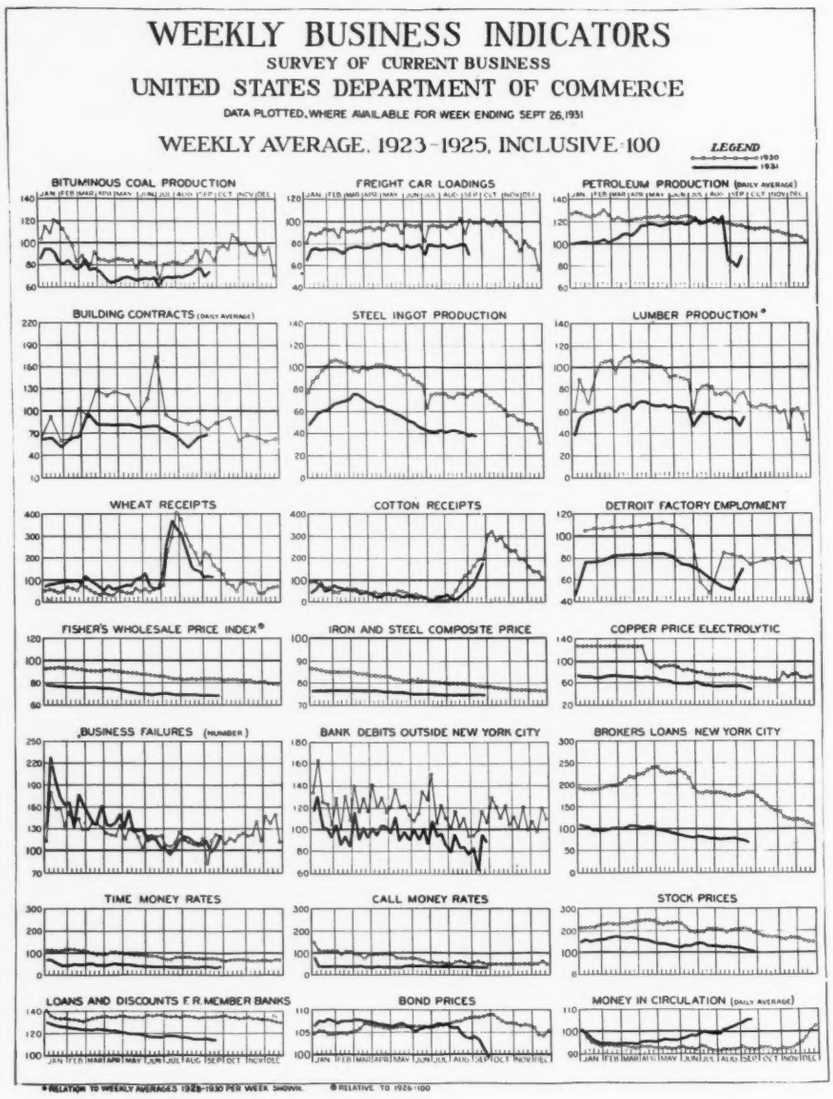
While recommending the application of a straight mileage scale for industrial sand, Mr. Fuller said reasonable group and differential adjustments may be maintained, provided the average rate under each adjustment shall not be higher than if made under the scale.

He said further that this recommendation should not be construed as authorizing the inclusion of the Mapleton and Hancock-Berkeley Springs districts in a single group in connection with Scale II for distances less than 700 mi., and that, in connection with the other rates prescribed, the Mapleton district should be accorded a differential under the Hancock-Berkeley Springs district not less than 50 per cent. of the difference under the scale to all destinations or destination groups to which the former is over 100 mi. less distant than the latter.

Mr. Fuller also recommended that the minimum weight on industrial sand be 90 per cent. of the marked capacity of the car, except that, when the car is loaded to full visible or cubical capacity, the actual weight should apply.

P. C. A. Closes District Office in San Francisco

The district offices of the Portland Cement Assn. in San Francisco, Cal., are reported to have been closed. Arthur P. Denton has been in charge of the office.


WEEKLY BUSINESS INDICATORS
SURVEY OF CURRENT BUSINESS
UNITED STATES DEPARTMENT OF COMMERCE
DATA PLOTTED, WHERE AVAILABLE FOR WEEK ENDING SEPT 26, 1931
WEEKLY AVERAGE, 1923-1925, INCLUSIVE=100
LEGEND
1930
1931
BITUMINOUS COAL PRODUCTION
FREIGHT CAR LOADINGS
PETROLEUM PRODUCTION (DAILY AVERAGE)
BUILDING CONTRACTS (DAILY AVERAGE)
STEEL INGOT PRODUCTION
LUMBER PRODUCTION*
WHEAT RECEIPTS
COTTON RECEIPTS
DETROIT FACTORY EMPLOYMENT
FISHER'S WHOLESALE PRICE INDEX*
IRON AND STEEL COMPOSITE PRICE
COPPER PRICE ELECTROLYTIC
BUSINESS FAILURES (NUMBER)
BANK DEBITS OUTSIDE NEW YORK CITY
BROKERS LOANS NEW YORK CITY
TIME MONEY RATES
CALL MONEY RATES
STOCK PRICES
LOANS AND DISCOUNTS F.R. MEMBER BANKS
BOND PRICES
MONEY IN CIRCULATION (DAILY AVERAGE)
JAN FEB MAR APR MAY JUN JUL AUG SEPT OCT NOV DEC
* RELATION TO WEEKLY AVERAGES 1923-1930 PER WEEK SHOWN.
* RELATIVE TO 1926=100

Editorials

A Bad Example

THE favorable reaction which followed the announcement of the United States Steel Corporation's cut of ten per cent. in wages was dissipated as soon as full realization of its inevitable results spread beyond the circle of steel-corporation stockholders. As a means of strengthening the company's financial position and of insuring the stability of its dividends the action had a tonic effect, but its influence on general business is something for which steel-corporation directors were either unconcerned or unprepared. As an example to other corporations, it furnished the most depressing news of a long period of slackened business and set the pace for what threatens to become a widespread reduction in wages.

The rapidity with which other corporations followed this bad example is clearly indicative of the timidity of large sections of industry and of the readiness with which some men rush to adopt the wage-cutting expedient, even when unnecessary, after someone else has had the courage to initiate the movement. Among the large corporations which have imitated the steel company there are doubtless many which had long felt the need for reducing their labor expense, while there are probably nearly as many which had not felt that need but, taking advantage of the present situation and of what they would call a "favorable precedent," have made drastic reductions. Timidity and cupidity will largely explain what may come to be regarded as the acme of stupidity.

For it is difficult to understand how the mass of the people—those who may spend little individually but who spend much collectively—can increase their buying in the face of reduced earning power; yet more active buying is unquestionably the answer to our present problem of reduced business. Government figures continue to show a reduction in the cost of living as measured by the purchasing power of the wholesale dollar, but the average man is finding some difficulty in discovering in precisely what directions his dollar has been strengthened. Ten-cent bread still costs ten cents, twenty five-dollar suits are still offered at twenty-five dollars, and the man who is trying to buy something on deferred payments is still asked to pay six per cent. for the privilege. From Woolworth to Marshall Field values are little if any greater than they have been in ten years. Prices may be lower, but they do not apply to the same quality of merchandise. Merchants may be taking in less money, but they are also giving less for it. Those who attempt to justify wage reductions on the ground that the working man's dollar has greater purchasing power than it had before will be hard pressed to prove this claim by actual demonstration.

One of the most lamentable features of the steel company's action, aside from its bad effect as an example to others, is the fact that, according to reliable information, neither the wage reduction nor the preceding salary reduction was necessary in view of the company's reported surplus of $400,000,000. The wage reduction will amount to approximately $25,000,000 a year, at which rate wages could be maintained at pre-reduction levels for sixteen years, assuming no further decrease in the volume of total business. The steel company's present working forces could be kept in idleness for nearly two years and be paid out of present surplus. This fact has undoubtedly encouraged many others to follow the steel company's lead, for if it, with its huge surplus, finds reduction necessary, what of the firm with little or no surplus!

If the majority of consumers are unable to spend enough to keep the wheels of industry busy, can they spend more on curtailed incomes? If they have a large cash surplus which they are hoarding —one of the most fanciful ideas that have lately come to our attention—and misgivings about the future have made them timid and fearful, will wage reductions instill new confidence and new hope, will they supplant uncertainty with security?

It is unfortunate that the steel corporation was the leader in this fresh attack on old wage standards, not only because its action affects nearly 300,000 workers and more than 1,000,000 dependents, but also because its industrial importance lends weight to its action and gives a large measure of plausibility to the argument of those who contend that wages must be reduced before business can recover. Probably no other single corporation in America could exert a similar influence on the industrial thinking and the industrial conditions of the country. It is regrettable, too, that there are so many who are willing to follow blindly a course which has the sanction of such a huge enterprise, who will entrust their own futures to the conclusions of its directors on the assumption that these men have the capacity to view and understand country-wide economic conditions and that they have the desire to act in the interest of the nation rather than in that of themselves and their stockholders. If the larger interests of the great mass of people are to be temporarily overshadowed by the questionable or seemingly necessary demands of certain corporations in order to satisfy individual expectations of stable and continuous profits, these same corporations must not be astonished if the result reacts unfavorably on their business volume and profits of the future. Increased profits call for increased business; greater business requires more spending; and greater spending can come only through greater earning. Buying power can not be increased through reductions in wages any more than wages can be raised in the face of declining business. Reductions in wages strike at the foundation of our economic structure; they check the flow of prosperity at the very fountain-head.

Has Management Failed?

STOCKHOLDERS are accepting lower dividends, bondholders are accepting lower returns on their lendings, and workers are accepting lower wages for their labor. All three groups look to management for an explanation and for relief, and management has been silent. Is management unequal to the task?

Management has greater responsibilities than the mere running of individual businesses and the satisfying of small groups of stockholders. On management rests the duty of directing the industrial life of the nation, of safeguarding it, of planning for and insuring its future. For the proper discharge of this responsibility management exacts and collects, and society pays, the compensation called profit. Management has been accepting the compensation; has it discharged the responsibility?

Many men high in industrial life understand this obligation that rests on management and they attempt to discharge it, although their efforts can not spread far beyond the confines of their own organization as long as the majority of industrialists do not feel and act similarly. But the recognition of this responsibility and the desire to meet it are growing, more rapidly as conditions—such as those through which we are passing—show the dependence of every industry and every man upon some other and the intricate manner in which society hangs upon industry and industry upon society.

Gerard Swope is one of those who see clearly this underlying fabric in which the threads of business and social welfare are inextricably intermingled. Present conditions have thrown this relationship into strong relief and they have shown the necessity for studying it, understanding it, and then organizing industry in ways that will improve and protect it. He, like many others, realizes that business can not prosper if the people at large do not prosper; that business grows only as much and as fast as the growth of the people allow; that business, if it would make its future secure, must be concerned about and adopt a helpful and responsible attitude toward the material well-being of the people who make business possible. He knows, as many others unfortunately do not, that business exists to serve the people and that the people do not exist to serve business.

Yet Mr. Swope and those who think much as he does understand that this does not impair the future of business, revolutionary as his proposals may appear to some. A man in his position and with his background can hardly be suspected of striving for anything inimical to the safe and profitable conduct of business, although there are elements of socialistic doctrine in his suggestions and he will be accused of promoting novel and, therefore, unsound ideas. Mr. Swope's position is that of every man who has taken the trouble to give more than casual attention to our problems and their causes; his proposals are in no sense impractical or visionary and they will strike no discordant note among those who have given the subject similar study.

Of course, Mr. Swope has not solved the problem; neither has he proposed anything that has not been suggested and discussed many times by men in all walks of life. His great contribution consists in his having voiced his proposals at a time when business men as well as the great masses of people are groping for a remedy, no less than in the fact that his statements carry great weight with business men, among whom (we regret to say) this type of thinking in social terms has not progressed as far as among those who have daily contact with the hardships of life and therefore understand its physical as well as its mental aspects. We favor Mr. Swope's proposals and we hope they will form the starting point for constructive consideration and discussion of our economic problems on the part of business men generally. We have a long way to travel before we overtake the thinking of the masses on this subject, and it is our opinion that Mr. Swope's assembling of several modern and sound ideas into a concrete proposal is a tremendous step forward.

Regularity and continuity of employment to be obtained through the stabilization of industry, and the adoption of unemployment insurance as an additional safeguard, is one of the principal features of his suggestion. The coördination of production and consumption through the intelligent study and action and for the benefit of the workers is another. Both proposals are in harmony with the industrial thinking of modern labor, although they may carry a suggestion of novelty to most business men. Yet, as it is evident that the success of the few is dependent on the success of the many, no labored pleading should be necessary to convince business men of the soundness of a plan which would insure business success by building upward from the bottom.

Mr. Swope's other suggestions regarding constructive and intelligent coöperation between industry and government, standardized stockholders' reports, leadership by industry to avoid the present lack of uniformity inherent in state regulation, the promotion of individual initiative and enterprise, and the protection of the public through government supervision will probably arouse no disagreement among business men. He has cleared the atmosphere by stating succinctly and unhesitatingly what he believes to be necessary steps in the salvaging of business and industrial society and he has made a fearless statement regarding the obligations of business to society.

"Industry exists basically for serving the needs of the people," he said in outlining his plan to the National Electrical Manufacturers' Association. "Shall we wait for society to act through its legislatures or shall industry recognize its obligation to its employees and to the public, and undertake the task?"

When management takes this intelligent view of the matter and is ready to formulate and act upon a well-reasoned plan based upon it, we can agree in saying that management has not failed but has succeeded eminently well.

The Nonmetallic Minerals of ALABAMA*

By WALTER B. JONES
State Geologist

ASBESTOS has been reported from the vicinity of Dudleyville and Alexander City, in Tallapoosa County; also in Coosa County; and in other scattered localities in the Crystalline area. The deposits consist of short-fiber material in the form of crystals weathered from underlying rocks, commonly peridotites, and found loose in the soil. None of the deposits have been developed, but they have potential value.

Asphaltum

Distribution.—Rocks carrying asphaltum are widely distributed in Morgan, Lawrence, Colbert and Franklin Counties in northwest Alabama. These rocks are both sandstone and limestone, although the latter group is confined to Colbert County.

Occurrence.—The formations carrying asphaltum belong to the Mississippian group, and may be described as follows:

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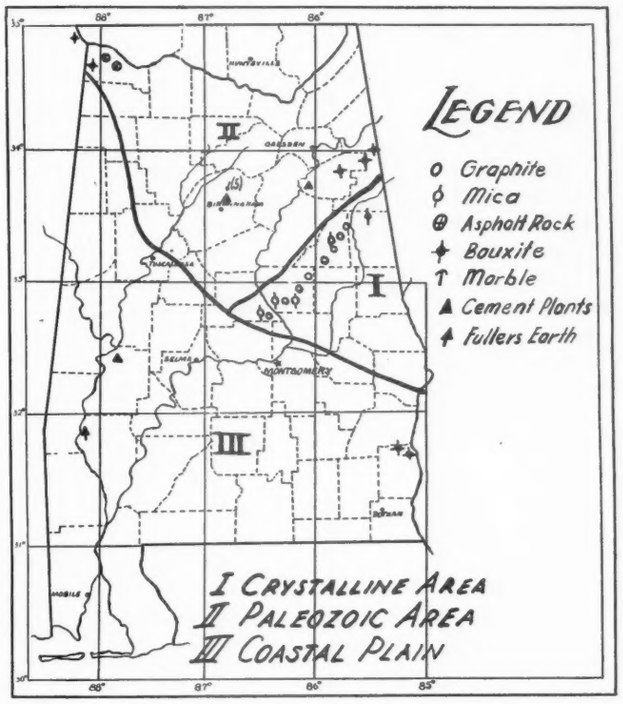
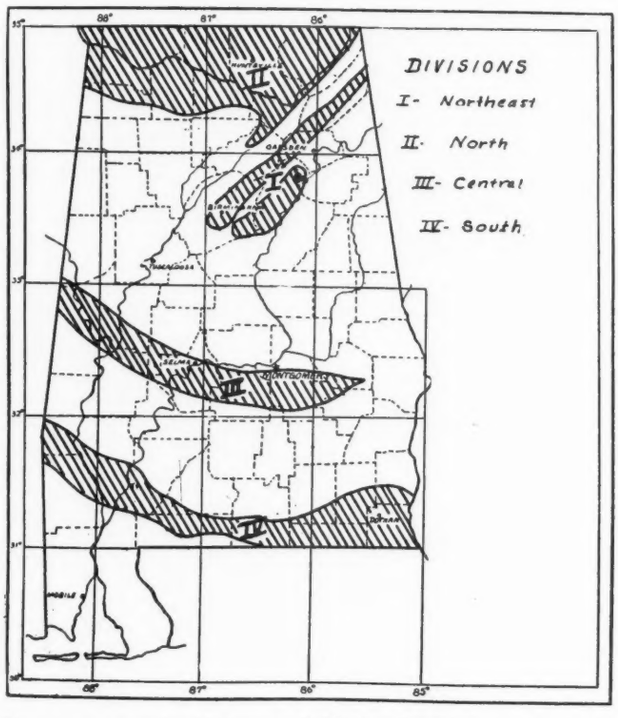


Locations of various non-metallic-mineral plants in Alabama.

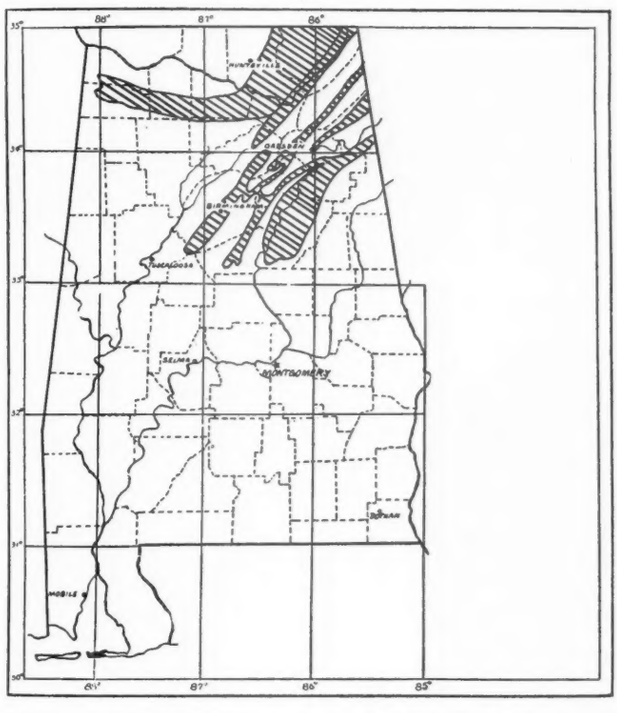
Bangor Limestone (restricted)—massive dark blue to light gray limestone, abundantly fossiliferous, carrying a few zones of small deposits of asphaltum or "tar springs"; in all about 500 ft.

Hartselle—medium- to fine-grained sandstone, massive-bedded, gray, carrying at least two zones of asphaltic material of commercial possibilities; 200 ft.

Golconda—thin-bedded limestone; 0 to 35 ft.



Limestone areas in Alabama suitable for Portland-cement manufacture. *Jones, Bull. 28, Ala. Geol. Surv.*



Limestone and dolomite areas suitable for fluxing purposes. *Jones, Bull. 28, Ala. Geol. Surv.*

Fig. 1. Quarry of the Colrock Co., near Cherokee, Colbert County.

Cypress—massive-bedded sandstone; 0 to 40 ft.

Gasper—oölitic limestone, calcareous shale and fine-grained, lithographic limestone; oölitic member in Colbert County is heavily impregnated with asphaltum and has been worked for nearly a decade; 120 ft.

Bethel—massive-bedded sandstone, asphaltic in part; 20 ft.

St. Genevieve, Tuscumbia, Lauderdale formations to base of Mississippian; 375 ft.

Development.—At present there are three plants in Colbert County working Gasper outcrops (Figs. 1 and 2). The material has been extensively used, particularly in street surfacing (Fig. 3), both on concrete and reconstructed bases. It is estimated that there are 86,000,000 tons of asphaltic limestone from the Gasper under 50 ft. of cover.

Bauxite

Distribution.—Bauxite was first discovered in Cherokee County in 1889, and has since been found in Calhoun, Talladega and DeKalb Counties, near Margerum in Colbert County (Fig. 4), and in Barbour and Henry Counties.

Occurrence.—The ore-bodies invariably occur in areas of heavily-weathered limestones and dolomites, and are usually in close proximity to the limestone. The geological horizons are Cambro-Ordovician, Mississippian and Midway (Eocene).

Fig. 2. View of the crushing plant of the Colrock Co.

The material ranges from bauxitic clays and siliceous bauxites to very high-grade ore.

Development.—Mining of bauxite soon followed its discovery, and has continued since with a few short lapses. Cherokee County, in the vicinity of Rock Run, has produced the bulk of the material (Fig. 5), but smaller amounts have been taken from Calhoun County; Talladega in Talladega County; Fort Payne in DeKalb County; and mines are now being operated in Barbour (Fig. 6) and Henry Counties. There still remains a quantity of material, particularly low-grade ore, which should find some useful place in industry.

Cement Rock

Distribution.—Alabama is abundantly supplied with raw materials for the manufacture of both Portland and slag-lime (Puzzolan) cement. Sharp folding in the Paleozoic formations has served to bring the various raw materials in close proximity to each other, and this factor has had a tremendous influence upon the development of the industry. Cement plants are located as follows:

Demopolis (Spocari), Marengo County — Portland-cement plant; uses Selma chalk, Cretaceous age, and residual clay.

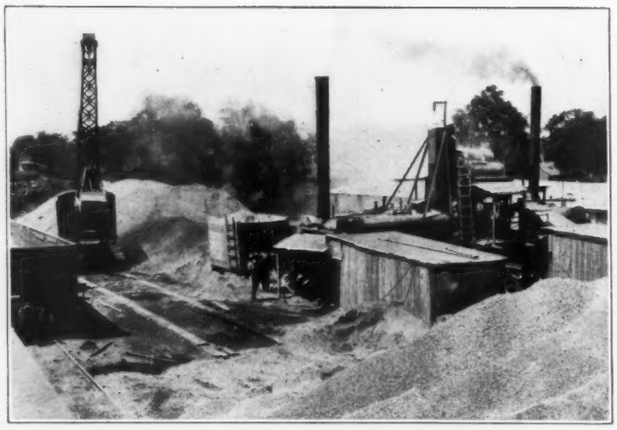


Fig. 3. Mixing plant preparing lime-rock asphalt for paving. Runyon Construction Co., Huntsville.

Ragland, St. Clair County — Portland-cement plant; uses little Oak limestone of Ordovician age and residual clay.

Leeds, Jefferson County — Portland-cement plant; uses LeNoir limestone of Ordovician age and residual clay.

Birmingham, Jefferson County—Three Portland-cement and 2 slag-lime plants; using Cambrian limestone, clay and shale, and slag from blast-furnaces.

Since limestone forms the bulk of the raw material, the plants are always placed at convenient quarry sites..

Occurrence.—There are four belts of limestones suitable for the manufacture of Portland cement, as follows:

1. Northeast Alabama, in the Coosa and neighboring valleys, carrying principally Cambrian and Ordovician limestones, all sharply folded.

2. North Alabama, or the Tennessee Valley region, with essentially undisturbed limestone of Mississippian age.

Fig. 4. Bauxite outcrop in ditch south of Margerum in Colbert County.

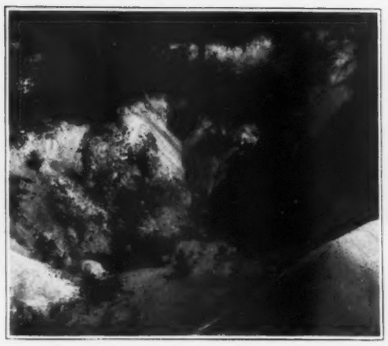


Fig. 5. Washer bank in bauxite deposits, Rock Run, Cherokee County.

Fig. 6. Bauxite mine of Republic Mining & Mfg. Co. in Barbour County.

3. Central Alabama, or the "Black Belt," where some 900 ft. of the Selma chalk (Fig. 7) of Upper Cretaceous age affords suitable raw materials. The Selma is a highly siliceous rock, and is close to a natural mix.

4. South Alabama, where a thin belt of St. Stephens limestone of Upper Eocene age affords some material for cement making.

Development.—In 1899 and 1900 two slag-lime cement plants began operations on granulated slag from the Birmingham furnaces. In 1901 the first Portland-cement plant began operations in Alabama, at Spocari. This plant was rebuilt in 1919 by the Gulf States Portland Cement Co. The Leeds plant came in 1905 and the Ragland plant in 1909. The Ragland plant was built by the Atlantic & Gulf Portland Cement Co., was acquired by the Coosa Portland Cement Co. in 1910 and by the National Cement Co. in 1919. In 1922 the Phoenix Portland Cement Co. built a plant at North Birmingham and the Lehigh Portland Cement Co. located at Tarrant City. In 1925 the Phoenix plant was sold and another was built near Powderly, in Birmingham. This was the huge Morton plant with tremendous kilns. The Morton plant was recently acquired by the Alpha Portland Cement Co. In addition to these, raw material is being drawn and shipped by barge from St. Stephens for a plant in New Orleans.

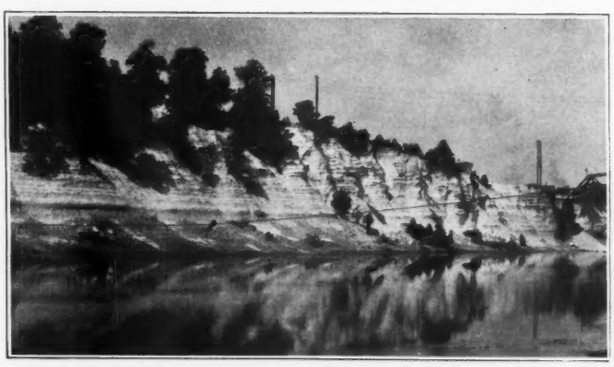


Fig. 7. Selma chalk on right bank of Tombigbee River at Epes, Sumter County.

The development of the cement industry in Alabama is limited only by the demand. The raw materials are practically inexhaustible.

Dolomite

Distribution.—Dolomite suitable for blast-furnace flux is typically developed in Opossum Valley, northeast of Birmingham, where are located the Thomas, Ketona, Dolcito, North Birmingham and other quarries. The same formation extends from Vance, Tuscaloosa County, through Jefferson, and is also found in Murphrees Valley from Chepultepec to Remlap.

Occurrence.—The utilization of dolomite for flux has been confined to the Ketona member (Figs. 8 and 9) of Cambrian age, a formation which consists of about 500 ft. of light gray, thick-bedded dolomite. The formation is somewhat cherty near the top, and the best material is usually found in the valley floors. Much pumping is necessary to keep down the flow of ground water.

Development.—Dolomite is regarded as near the ideal in blast-furnace flux and considerable quantities of it have been used, particularly in the Birmingham district. The supply is entirely adequate. The following analysis is typical for the Ketona:

Silica	0.70 per cent.
Alumina	.63 per cent.
Calcium carbonate	55.41 per cent.
Magnesium carbonate	43.00 per cent.
Total	99.74 per cent.

Granite

While granite and other crystalline rocks have not been much used in Alabama, they occur in great quantities and are suitable for road building, concrete, railroad ballast and the like. Numerous quarry sites are available, which would be without cover and close to transportation. These areas have potential value.

Fig. 8. Dolcito quarry in the Kentona dolomite, Tarrant City, Jefferson County.

Fig. 9. Incline to the dolomite-crushing plant at the Dolcito quarry.

Gypsum

Small and scattered crystals of gypsum (Selenite) have long been known from the Black Bluff and other Eocene formations, but so far they have not been found in commercial quantities. Recently the writer examined a deposit in Jackson County (NE¼ NE¼ S33 T1S R5E) where a fine outcrop of Bangor limestone showed two beds of limestone carrying large masses of gypsum. The gypsum-bearing rocks are some 330 ft. below the top of the Bangor. Since that time, other occurrences of gypsum have been noted in the Bangor, and it is likely that commercial deposits may result from this knowledge.

Kaolin

The northwestern part of Randolph and adjacent parts of Cleburne and Clay Counties carry numerous pegmatite dikes, with which are associated kaolin deposits of commercial possibilities. To date there has been little development in this area, but the quality and quantity of the material warrant consideration.

Limestone

Distribution.—(See Cement Rock.)

Occurrence.—Although practically all limestone-bearing formations have been utilized for some purpose or other, five groups have been most widely used, as follows: (1) Bangor of Mississippian age; (2) Ordovician limestones; (3) Conasauga of Cambrian age; (4) Selma chalk of Cretaceous age; and (5) St. Stephens limestone of Oligocene age. Added to this group would be the St. Stephens belt and the Clayton of Eocene age; the Selma of Upper Cretaceous age; and the Jasper, St. Genevieve, Tuscumbia and Warsaw formations of Mississippian age.

Fig. 10. Typical roadside quarry in Bangor limestone near Huntsville, Madison County.

1. The Bangor limestone (Fig. 10) has its best development as a limestone in northern Alabama, where it ranges from 400 to 600 ft. in thickness. In various places the Bangor carries lenses of

Fig. 11. Outcrop of Conasauga limestone south of Jacksonville, Calhoun County.

oölitic limestone, and these have very fine expression in Franklin County, where much dimension stone of high quality is being produced. These lenses are likewise high in calcium carbonate, normally ranging above 95 per cent. Due to the great thickness of this formation, splendid quarry sites are available at almost any desired locality. Perhaps the largest quarries in the Bangor are the Rockwood, Franklin County; Blount Springs, Graystone, and Compton quarries in Blount County; and Glencoe in Etowah County.

2. The Ordovician group includes the following:

Series	Formation	Thickness (ft.)
Chazy	Chickamauga	250
	Little Oak	500
	Lenoir	500
	Mosheim	100
Beekmantown	Odenville	50
	Newala	1,000
	Longview	500

These formations show their best development in the Cahaba Valley, from Bibb County northeast-

Fig. 12. Quarry and plant of the Keystone Lime Works, Shelby County.

ward, where they have been exploited to a considerable extent for lime-making, flux, cement, crushed stone and the like. As a rule the material is high in $CaCo_3$, often reaching an average quarry run of 97 per cent.

3. The Conasauga limestone (Fig. 11) is best

exposed in the sharply-folded anticlinal valley around Birmingham, where the formation is about 1,000 ft. thick. Most of this thickness is made up of dark blue to black thin-bedded limestones; the remainder being shales. The Conasauga is widely used in the Birmingham district for cement making.

4. The Selma chalk is about 1,000 ft. thick at its type locality at Selma, Dallas County, and thins out eastward to disappear entirely in the eastern part of the state. Near the Mississippi line the Selma merges into the overlying Ripley sands. It is quarried at Demopolis for cement making. The Selma runs from 60 per cent. to 86 per cent. $CaCO_3$. An analysis of typical Selma at the Spocari cement plant shows:

SiO_2	Fe_2O_3-Al_2O_3	$CaCO_3$	$MgCO_3$	So_3	Total
12.30%	2.76%	80.71%	1.05%	1.62%	98.64%

5. The St. Stephens or Marianna limestone is similar to the Selma chalk, except that it is higher in CaCO (usually above 90 per cent.) and is only 80 ft. thick. The belt, even though it is thin, extends over most of the southern part of the state.

Fig. 13. Landmark quarry of the Shelby Lime Works in Shelby County.

This material is used for cement making and road building.

An analysis of typical St. Stephens limestone from the type locality at St. Stephens Bluff, Tombigbee River, shows:

SiO_2	Fe_2O_3-Al_2O_3	$CaCO_3$	$MgCO_3$	So_3	Total
2.28%	2.04%	92.85%	1.92%	.13%	99.22%

Marble

Distribution.—The Crystalline limestones or marbles of Alabama occur along a narrow belt some 35 mi. long from Marble Valley in Coosa County through Talladega and into Calhoun. The belt is widest and best developed near Sylacauga, Talladega County, where are located the quarries of the Alabama Marble Co., the Moretti-Harrah Co., and the Alabama White Marble Co. Some limestones from the Paleozoic formations take a very good polish, particularly the Conasauga.

Occurrence.—It is difficult properly to place the age of the marble belt on account of its highly metamorphosed condition, but it is thought to be Cambrian or early Ordovician. The lens or belt is strongly tilted (Fig. 14) and is surrounded mostly by Cambrian dolomites and Talladega slates. An analysis of white marble from Gantt's quarry shows:

Fe_2O_3	CaO	MgO	CO_2	Total
0.25%	55.62%	0.13%	43.77%	99.77%

Development.—Gantt's quarry of the Alabama Marble Co. (Fig. 15) has been in continuous operation since the Civil War, and the Moretti-Harrah quarry (Fig. 16) has been producing for many years. There are several other prominent openings.

Mica

Distribution.—Most of the mica deposits in Alabama are confined to a narrow belt extending southwest-northeast through Randolph, Clay and Coosa Counties. Minor openings have been made in other counties in the Crystalline area, but most of them have been unsuccessful.

Occurrence.—The mica deposits are found as loose crystals in weathered pegmatites, which occur in the schists and gneisses of the Ashland Series. The pegmatites are in the form of veins or dikes in which the main constituents, quartz, feldspar and mica, are segregated in large crystals or masses.

Development.—Many pits and shafts have been sunk for mica in Alabama, and at one time the state had a very creditable production. Since the World War the output has been steadily declining,

Fig. 14. Tunnel in old opening at Gantt's Quarry, now abandoned.

Fig. 15. Present opening of the Alabama Marble Co. at Gantt's Quarry.

Fig. 16. Quarry of Moretti-Harrah Co. showing marble and cover.

Fig. 17. Ocher pit near Jackson, Clarke County.

Fig. 18. Crumpled slate of Talladega formation.

Fig. 19. White sand near base of Nanafalia formation.

until it has reached the spasmodic stage. The scarcity of large-cut sheets has made it difficult to operate Alabama mica mines.

Ocher

Distribution.—Deposits of red and yellow ocher are widely distributed over Alabama, with 19 separate groups of ore-bodies in 14 counties.

Occurrence.—The deposits occur both as sedimentary and residual, the former prominent in southern Alabama and the latter outstanding in the Paleozoic area. Of the sedimentary deposits, few are more than 6 ft. thick. The residual ore-bodies are usually small.

Development.—Some ocher has been mined from the Jackson and Walker Springs deposits, Clarke County (Fig. 17), while the remainder of the occurrences are still in the prospecting stage.

Shales

Distribution.—Shales or mudstones are widely distributed throughout the state and are found in formations of all ages, except the older Crystallines.

Occurrence.—Among the more important formations carrying shales are those shown in the table in the next column. An analysis of typical Coal-Measures shale shows:

SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Alkalies	Ignition (estimated)	Total
57.80%	25.00%	4.00%	2.10%	0.80%	1.80%	8.50%	100.00%

Development.—Of the many formations which carry shales, the Coal Measures has been most important in the matter of development. Most of the production of shale goes into the manufacture of clay products and cement and practically all this comes from the Coal Measures.

Period	Series	Formation	Thickness (*ft.*)	Remarks
Tertiary	Oligocene	Red Bluff	30	Mudstone
	Eocene	Hatchetigbee	175	Shale and sand
		Tuscahoma	140	Shale in part
		Naheola	150	Mostly shale
		Sucarnoochee	200	Shale
Cretaceous	Upper	Tuscaloosa	1,000	Shale in part
Carboniferous	Pottsville	Coal Measures	5,500	Mostly shale
	Mississippian	Parkwood	2,000	Shale in part
		Floyd	1,000	Mostly shale
		Pennington	200	Calcareous shale
Ordovician	Chazy	Athens	300	Mostly shale
Cambrian		Conasauga	1,000	Small part shale
		Montevallo	1,000	Mostly shale
Crystalline		Talladega	15,000	Shale and slate

Sand and Gravel

Distribution.—Due to the great variety in the formation of sand and gravel and their deposition and frequent transfer, these minerals are found in every part of the state.

Occurrence.—Stream-bed or flood-plain deposits are most generally distributed through the state and furnish the bulk of the production, particularly for road and other construction. These types of deposits also provide a good portion of the bonded molding sands.

(*Continued on page 36*)

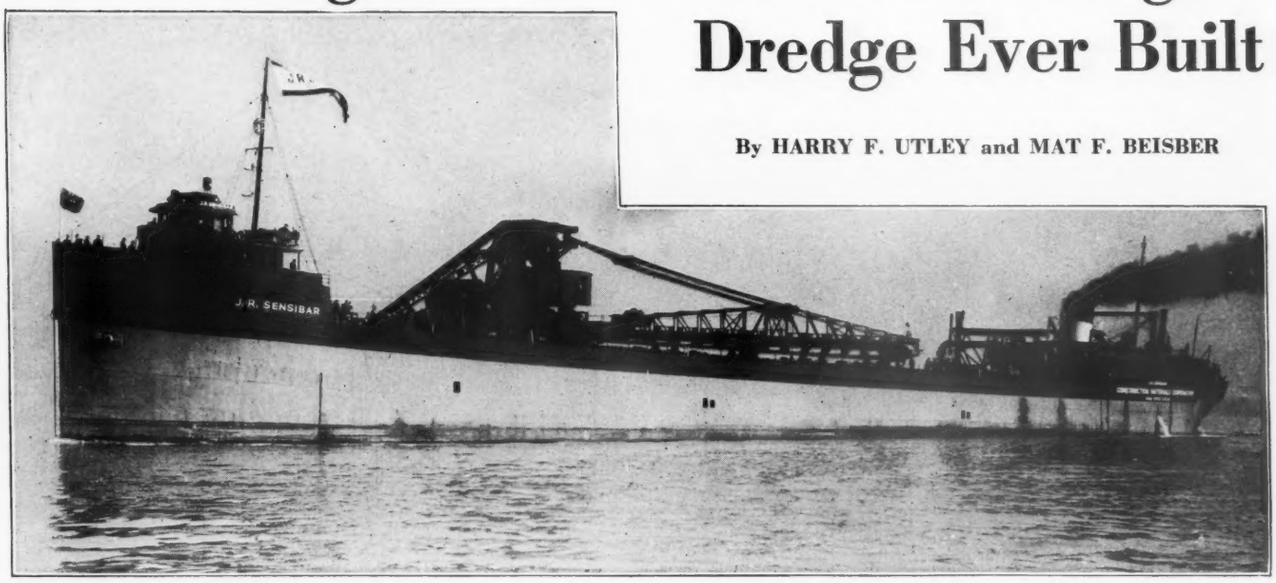
Fig. 20. Gorge cut through ledge of marl into sand in Ripley formation, Barbour County.

Fig. 21. Gulley in cross-bedded sands of the Eutaw formation near Montgomery, Ala.

Fig. 22. Lavender molding sand of Tuscaloosa formation in Franklin County pit.

An Overnight Cruise Aboard the Largest Dredge Ever Built

By HARRY F. UTLEY and MAT F. BEISBER



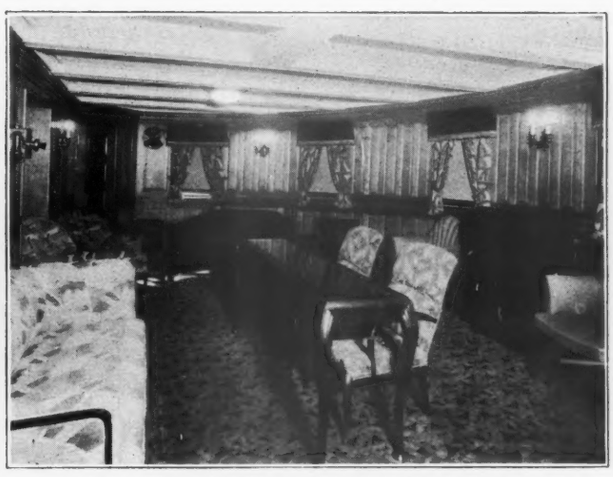
The "J. R. Sensibar," flagship of the Construction Materials Corp. fleet.

THE sun has dropped below the western horizon and a few stars begin blinking in the rapidly-darkening dome of the sky. A cooling breeze, as gentle and caressing as the late summer evening, comes in over our starboard beam as the 550-ft. ship plows eastward. From somewhere below, the strains of a guitar played by a member of the crew drift up to us, adding still another touch of romance to our journey. Cruising in the Caribbean? We might be, were we to let our imaginations wander. But in reality we are riding the fore deck of the *J. R. Sensibar,* the pride of the lake fleet of the Construction Materials Corp., of Chicago, and the largest vessel of its type in the world, bound southeastward on Lake Michigan for an overnight trip to the fringe of the Indiana dunes, where we are to take on a 6,000-cu. yd. load of sand to be used for fill purposes in the extension of Lincoln Park on Chicago's north side.

The *J. R. Sensibar* is a new ship, the details of her mechanical equipment having been described in the March 25, 1931 issue of PIT AND QUARRY. From her outward appearance, however, one would little suspect that below the pilot-house it contained such luxurious appointments and comfortable guest quarters. Four staterooms, as tastefully furnished and decorated as on the finest ocean-going liner, open from a cozy reception room. Two complete bathrooms—even a kitchenette with an electric refrigerator constantly producing ice-cubes—are found on board. Above is the semi-circular observation lounge, where, through many windows, the panorama of water and sky and ships unfolds before us.

Boarding the vessel shortly before sundown at its discharge dock we are greeted by the genial Capt. Harvey Bricker and his first mate, James Haigh, who bade us make ourselves comfortable and to watch the process of unloading. The last of the six huge compartments is being emptied. Nozzles

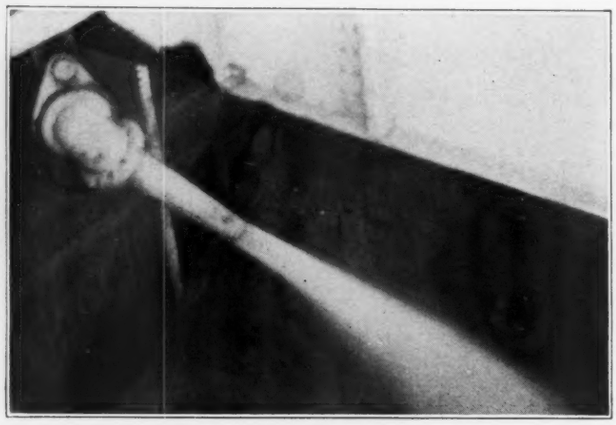
The reception room is cozy and enjoyable. The state-rooms and kitchenette adjoin.



Comfortable furnishings and a radio make the guest feel "at home" in the ship's observation lounge.

In the wheel-house. Radio compass at left, pilot-house control at right.

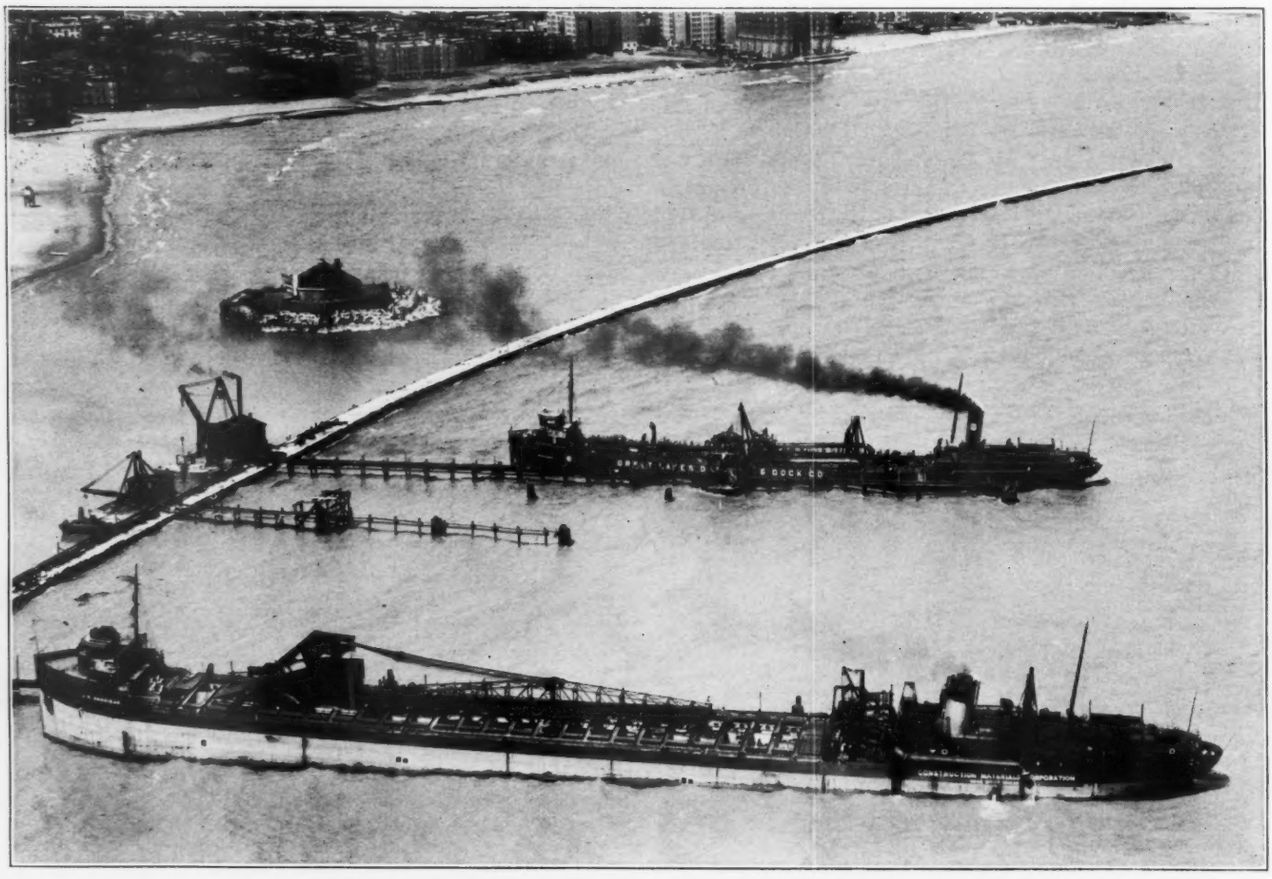
located below the hatch-covers direct a powerful stream of water into the dry sand cargo—actually dry because of the ship's marvelous drainage facilities—washing the material through gates to an inclosed flume running the full length of the ship. From this flume, the sludge is pumped by one of the 30-in. centrifugal pumps through a 30-in. pipeline, discharging the material along the shore line a mile or so away. This, we learn, is by no means remarkable, for the *J. R. Sensibar's* powerful pumps are able to force the material through a pipe-line four miles long if necessary! This wonder ship can also unload its cargo dry by means of conveyors deep down in the hold, which connect with a boom conveyor on deck. The latter is one of the most unique ever built. Imagine, it can pile sand 80 ft.



One of the nozzles directing a powerful stream of water into the dry sand in the hoppers.

high, 145 ft. from the side of the ship, even to a point opposite the ship's bow!

Finally, the last ton of sand is disposed of. The discharge pipe is uncoupled. We are about to set sail. The first thing we notice is the smoothness with which the ship moves forward. The throb of



The "J. R. Sensibar" at the discharge dock in foreground. Some of the "made" land, already being used as a bathing beach, is seen in the upper left portion of the picture.

The "J. R. Sensibar" at its discharge dock in the right background. The sand and water discharging from the pipe-lines to make new lake-front land is seen in the foreground.

the engines usually felt on a steamship is missing. This is because the *J. R. Sensibar* is an electric-motor ship, a steam-turbine direct-connected to an alternator producing 850 amp. at 2,300 v. to drive the 3,000-hp. motor which propels the ship.

Up in the pilot house we set up a course E by SE. Our whistle sounds a salute to a sister ship of the Construction Materials Corp. fleet, the *Sandmaster*, returning with a load of sand in her hoppers. Within close reach of the wheelsman are the most modern controls on anything afloat. By the touch of his hand, he actually directs the movement as well as the direction of the ship—true pilot-house control. At his left is a modern radio compass and, at his right, electric depth gauges. We wonder if an old-time pilot wouldn't turn over in his grave at the wonder of it all.

Other guests are dancing and making merry in the observation lounge below. The music comes from a radio which picks up the broadcast of an orchestra playing in a Chicago station. The city, now five miles or so distant, is merely a strip of blinking lights, reminding one of the illuminated back-drop of some forgotten Broadway musical show. We go below to join the merrymaking. The freshening breeze makes one hungry and, as if anticipating our desires, the ship's cook enters, bearing a tray heaped high with sandwiches and carrying a pot of steaming coffee. The cook immediately becomes the man of the hour and his offerings are consumed with great gusto.

Suddenly our speed slackens. Our powerful searchlight, its beam stabbing the darkness, has picked up a string of buoys which marks the bar where the *J. R. Sensibar* is to load. The anchor drops. The suction pipe is lowered and, almost before the ship has stopped, the giant pumps are drawing up the sand and discharging it into the hoppers through the upper flumes. For a while it seems as if the ship will shatter its previous record by taking on a full cargo in less than an hour and a half. Then the supply from the bar 30 ft. down becomes less productive and the level of material in the hoppers rises more slowly. We will probably

One of the four state-rooms for the ship's guests.

A view aft on the ship showing the suction pipe for loading.

load in about four hours. Even that is better than on the preceding trip, the mate informs us. Nearly eight hours of steady pumping had been required to load, due to the fact that much pea gravel was encountered.

We are not to witness the completion of the loading process, however. It is now past midnight and the tang of the clean air in mid-lake has made us drowsy—the immaculate staterooms have a sudden inviting appeal. The breeze sings through the portholes and the drone of the pump turbines far aft soon lull us gently to dreamless slumber.

Early next morning we awaken, the sun streaming through the ports. We are just steaming up to the discharge dock where we boarded the ship on the previous day. By the time we have bathed and dressed the pumps are already at work emptying the hoppers loaded during the night and, in the morning light, we can just make out the end of the pipe-line in the distance spouting its muddy stream, making new land on the lake front. One million cubic yards of material has already been pumped into the fill and ten times that amount still remains to be deposited to add many acres to Chicago's water-front park property. The densely-built metropolis has only one way to expand and that is lakeward. And the *J. R. Sensibar* is doing its part to provide recreational space for the laughing children and pleasure-seeking grownups of the future —space that in a few years will be covered with a velvety carpet of grass, trees and shrubs.

And so, after a hearty breakfast, we bid our hosts adieu. It has been a delightful and instructive "vest-pocket" voyage and we resolve to make the trip again in the not-too-distant future.

Nonmetallic Minerals of Alabama

(Continued from page 32)

Fig. 23. Jackson Lake operation of Kirkpatrick Sand & Gravel Co. near Prattville, Elmore County.

Sedimentary deposits of sand and gravel are subjoined:

Period	Series	Formation	Thickness (Ft.)	Predominating
Quaternary	Pleistocene		100	Sand
Tertiary	Pliocene	Citronelle	400	Sand
	Eocene	Gosport	35	Sand and marl
		Nanafalia (Fig. 19)	200	Sand and clays
Cretaceous	Upper	Ripley (Fig. 20)	450	Sand
		Eutaw (Fig. 21)	400	Sand
		Tuscaloosa (Fig. 22)	1,000	Gravel and sand

Of these, the Tuscaloosa covers a large area and the sand and gravel from its beds furnish a large

Fig. 24. Tuscaloosa gravel over white sand, Spruce Pine Sand & Gravel Co., Franklin County.

quantity of road material, concrete sand and gravel, building and molding sand, and other specialized products.

Development. Pits and operations in the sand-and-gravel industry are too numerous to mention, but some of the larger ones are as follows:

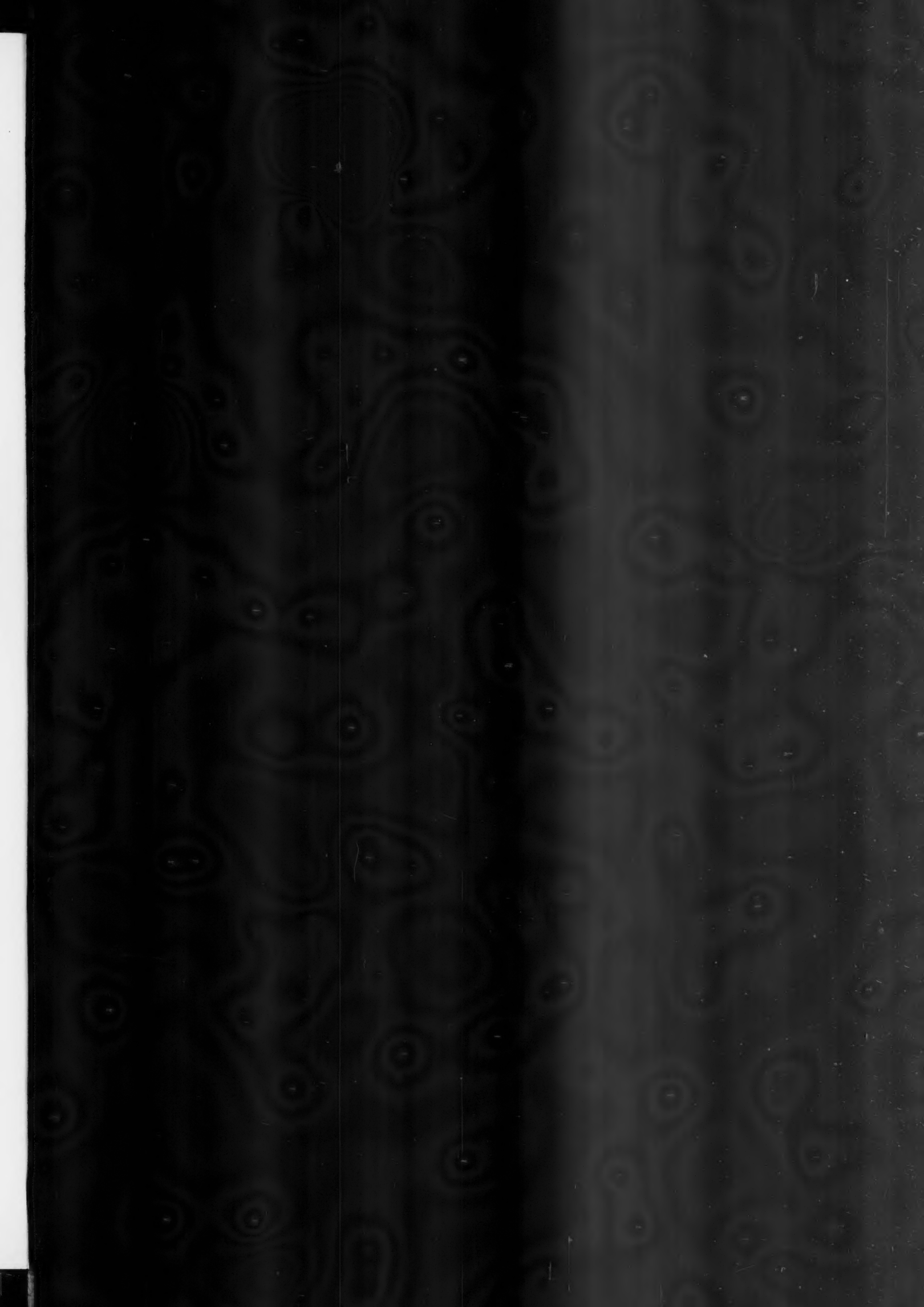
Fig. 25. Gravel dredge operating in Alabama River above Choctaw Bluff.

Producer	County
Southern Sand & Gravel Co.	Clarke
Tennessee Sand & Gravel Co.	Colbert
Underwood-Walker Co.	Elmore
Kirkpatrick Sand & Cement Co. (Fig. 23)	Elmore
Spruce Pine Sand & Gravel Co. (Fig. 24)	Franklin
Huntsville Transfer & Building Materials Co.	Madison
Demopolis Lumber Co.	Marengo
Baker Gravel & Material Co., Inc.	Mobile
Mobile & Gulf Navigation Co.	Mobile
Montgomery Gravel Co.	Montgomery
Alabama Sand & Gravel Co.	Montgomery
Roquemore Gravel Co.	Montgomery
Baker Sand & Gravel Co.	Tuscaloosa

The bulk of this production comes from dredge-boat operations (Fig. 25) on stream beds or banks.

Soapstone

Soapstone appears to be rather widely distributed throughout the Crystalline area particularly in Tallapoosa, Chambers and Randolph Counties, where it consists of a green to gray schistose rock which sometimes carries garnet actinolite and other materials. The only development has been local, principally as linings for chimneys, lime kilns, bake ovens, utensils, and the like.



Pit and Quarry

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ANNUAL SAND AND GRAVEL SECTION

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A view in the quarry. Note truck roadways.

Loading the blasted rock to a motor-truck.

Four-Wing Tunnel-Conveyor System Recovers Finished Materials

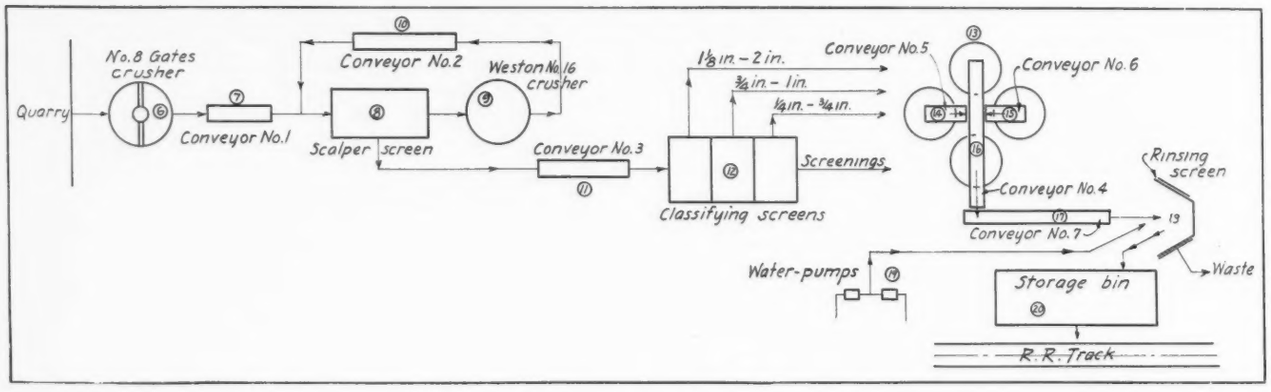
Stock-Piling Method Is Feature of New Crushed-Stone Plant at Watauga, Tenn.

BESIDES its thoroughly-modern methods and equipment, an interesting feature of the New Watauga Stone Co. plant is its 4-wing tunnel-conveyor system of finished-material stock-piles. While ground-storage stock-piles with tunnel-conveyor recovery systems are not new, the "Watauga" arrangement is, and it presents several advantageous features.

Looking at the new stock-pile arrangement without its covering of stocked materials, it will be seen to consist of four concrete tunnels radiating from a hub-like center, the whole being similar in shape to a 4-spoke wheel without the rim. Projecting vertically from the hub is a 20-ft. by 20-ft. steel tower-like structure 60 ft. high, which acts as a support for a large vibrating screen and the inclined conveyor leading to it. One or more grades of materials are spouted to piles above each wing. Possibly the most important of the advantages of this system is its ability to receive large piles on a relatively small space, particularly so where yard area is limited.

The Watauga Stone Co., one of the newer companies in the industry, is located at Watauga, Tenn., on a site formerly worked by its predecessor for 25 years. After acquiring the property the new company began at once a reconstruction program entailing the complete revision of quarrying methods and the transportation of blasted rock, as well as the erection of new buildings housing new screening machinery and the like. The company began production on July 15, 1930, with facilities for processing 700 tons of stone per day.

Under the new management, 5 trucks have supplanted former methods of hauling blasted rock to the primary crusher. These are Mack 7½-ton units equipped with Easton 8-cu. yd. bodies. With the primary crusher near the quarry-floor only a slight grade is encountered. The run to and from the crusher is over a triangular-shaped road, the



Flow-sheet of Watauga Stone Co. plant operations.

The Watauga Stone Co. plant, showing the 4-wing stock-piling system at the left.

round trip being approximately 300 ft. As this is a rather short haul, the truck lends itself admirably to the quarry because of its flexible operation and usefulness for other purposes.

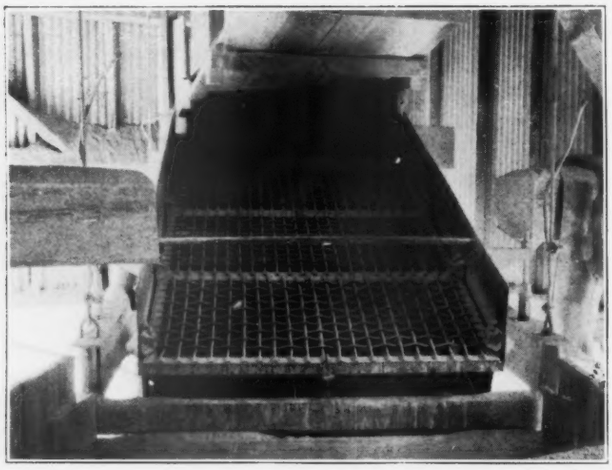
Stone is quarried from a 70-ft. ledge by standard practices of bench drilling and blasting. Two-inch holes are drilled on about 4-ft. centers by Chicago Pneumatic sinker-type drills to a depth of 20 ft. These holes carry a burden of 10 ft. and are loaded with Atlas 60-per cent. ammonia dynamite. Up to the present time a yield of 4.5 tons of rock per lb. of explosive has been maintained. The blasted rock is loaded by a Thew 1¼-cu.yd. crawler-type steam-shovel.

The design of the processing plant embraces the straight-line-flow idea with all crushing done at ground level. On a level close to the quarry floor an Allis-Chalmers No. 8 Gates type crusher is lo-

TABULAR ANALYSIS OF THE OPERATIONS AND EQUIPMENT OF THE WATAUGA STONE CO., WATAUGA, TENN.
(Key numbers above 5 refer to corresponding equipment shown on the accompanying flow-sheet.)

Operation	Key	Equipment	Make	Size, Capacity, Type	Power Source	Drive
Drilling	1 2	Rock drills Air-compressor	Chicago Pneumatic Ingersoll-Rand	Sinker 2-cylinder	100-h.p. G. E. motor	
Loading	3	Steam-shovel	Thew	1¼-cu. yd., crawler		
Transportation	4	Motor trucks	Mack	7½-ton, 8-cu. yd. Easton bodies		
Dumping	5	Hoist	Curtis	Air-cylinder		
Primary crushing	6 7	Crusher Conveyor No. 1	Allis-Chalmers Gates Stephens-Adamson	No. 8 24-in., 140-ft. between centers	100-h.p. G. E. motor 25-h.p. G. E. motor	Texrope Falk speed-reducer
Scalping	8 10	Screen Conveyor No. 2	Stephens-Adamson Stephens-Adamson	5-ft. by 8-ft., 1-deck 20-in., 64-ft. between centers	5-h.p. West motor 10-h.p. G. E. motor	Direct Falk speed-reducer
Secondary crushing	9 11	Crusher Conveyor No. 3	Weston Stephens-Adamson	No. 16 20-in., 203-ft. between centers	30-h.p. Ideal motor 25-h.p. G.E. motor	Direct Falk
Screening	12	Screen	Stephens-Adamson	5-ft. by 8-ft., 3-deck	8-h.p. West motor	Direct
Storage	13			4,000 tons		
Recovery from storage	14 15 16 17	Conveyor No. 4 Conveyor No. 5 Conveyor No. 6 Conveyor No. 7	Stephens-Adamson Stephens-Adamson Stephens-Adamson Stephens-Adamson	24-in., 105-ft. between centers 24-in., 45-ft. between centers 24-in., 45-ft. between centers 24-in., 85-ft. between centers	10-h.p. G. E. motor 5-h.p. G. E. motor 5-h.p. G. E. motor 25-h.p. G. E. motor	Falk speed-reducer Falk speed-reducer Falk speed-reducer Falk speed-reducer
Rinsing	18	Screen	Stephens-Adamson Gilbert	84-in. jacketed	25-h.p. G. E. motor	Falk speed-reducer
Pumping	19	Centrifugal pump	Fairbanks-Morse	6½-in. by 5 in.	25-h.p. G. E. motor	Belt
Loading	20			10-ton wooden bin		
Car spotting	21	Locomotive	Porter	20-ton		

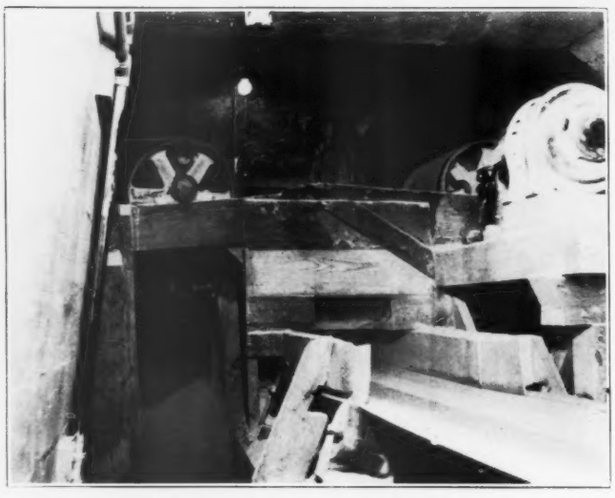
cated. A special truck-dumping platform has been constructed adjacent to the crusher hopper and the truck body is raised and dumped by means of a Curtis air-hoist. The primary crusher reduces the rock to a maximum size of 2¾-in. Conveyor No. 1 transports it to a Stephens-Adamson 5-ft. by 8-ft. single-deck vibrating scalping-screen which is operated in closed-circuit with a Weston No. 16 crusher. Rolman 2-in. wire cloth on this screen rejects oversize stone to the crusher for reduction to 1¼ in. The stone is then received on conveyor No. 2 for its return to conveyor No. 1, which, in turn, delivers it to the scalping-screen. Materials passing the scalping-screen are conducted by con-



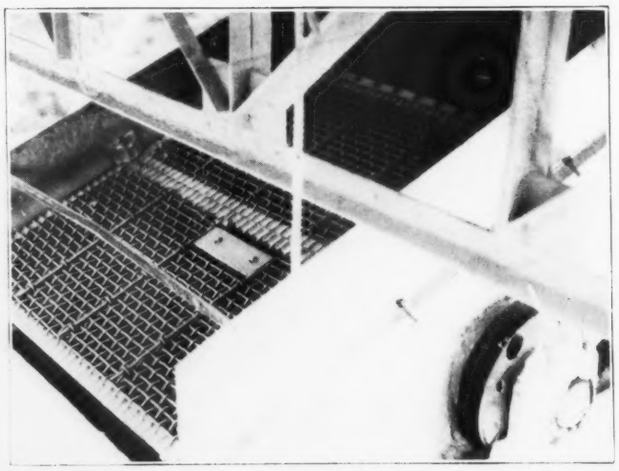
Single-deck screen used as a scalper.

veyor No. 3 to the 3-deck Stephens-Adamson 5-ft. by 8-ft. vibrating screen for final classification.

This screen is mounted on the steel-tower structure above the wing-type stock-pile tunnels, as already noted, and separates the dry materials into 4 grades, namely 2-in., 1-in., ¾-in., and screenings. Each size is spouted to a pile over one of the tunnel-conveyor wings. The conveyor tunnels are of standard reinforced-concrete construction, each wing being approximately 50 ft. long. A single belt-conveyor (No. 4), 105 ft. long between centers,



At the hub of the 4-wing conveying system for recovering material from the stock-piles.



The triple-deck classifying screen.

extends throughout the length of two of the wings. Two short conveyors (Nos. 5 and 6), each 45 ft. in length, are located in the wings, perpendicular to the 105-ft. conveyor, and discharge to the latter at the "hub" of the system.

Materials are recovered from the stock-piles through 4 bin-gates mounted in the roof of each tunnel wing. Conveyor No. 4 extends to meet the last conveyor in the plant series, No. 7, which leads to a rinsing screen over the car-loading plant. About

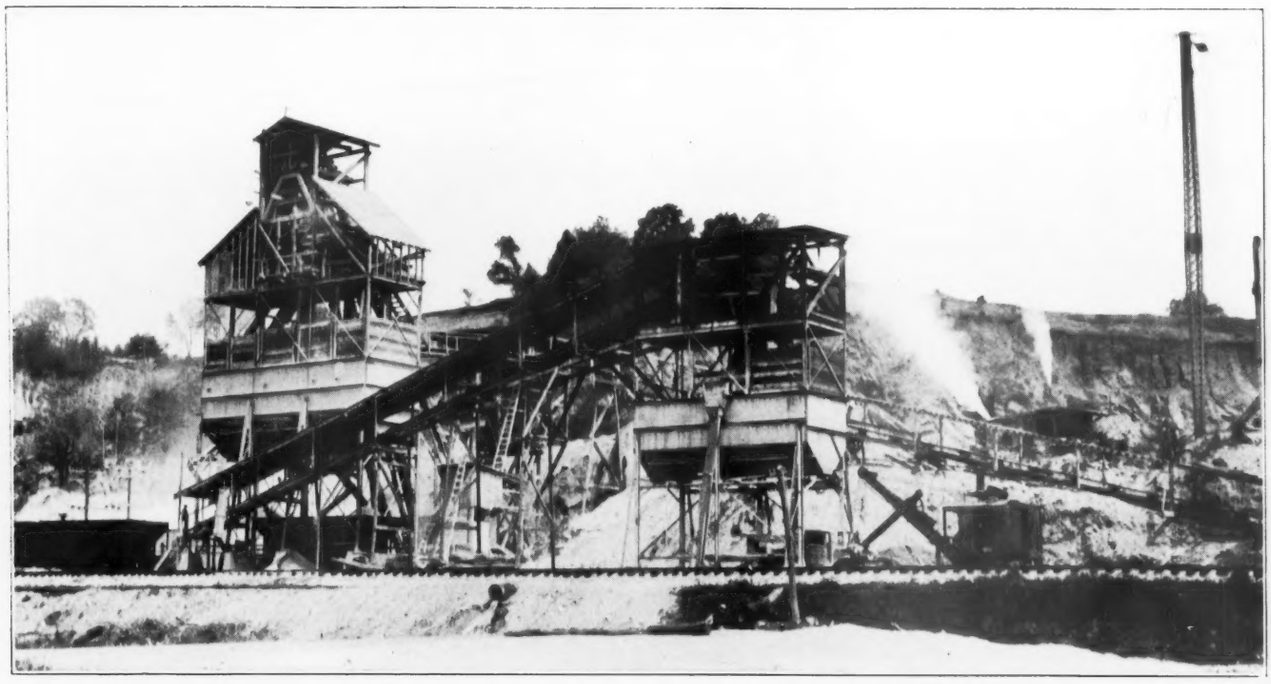
Typical speed-reducer drive on one of the conveyors.

4,000 tons of stone is stored in this stock-pile system. Additional ground storage is provided by means of a power drag-scraper.

A 10-ton bin, spanning the company's side-track on the Southern Railroad, provides temporary storage while loading cars beneath. Materials from the storage system are received in a jacketed Gilbert screen, where they are thoroughly washed and rinsed before loading. Cars are "spotted" by a Porter locomotive.

The series of conveyors, which includes 7 units, is made up of Stephens-Adamson equipment and is powered by individual General Electric motors through Falk speed-reducers. The two inclined conveyor head-pulleys are fitted with special

(*Continued on page 51*)



The new plant showing dry-loading bins at left, washed-material bins at center.

Rebuilds Crushed-Granite Plant to Cut Production Costs to Minimum

New Quarry-to-Plant Haulage System Is Principal Factor in Effecting Economy

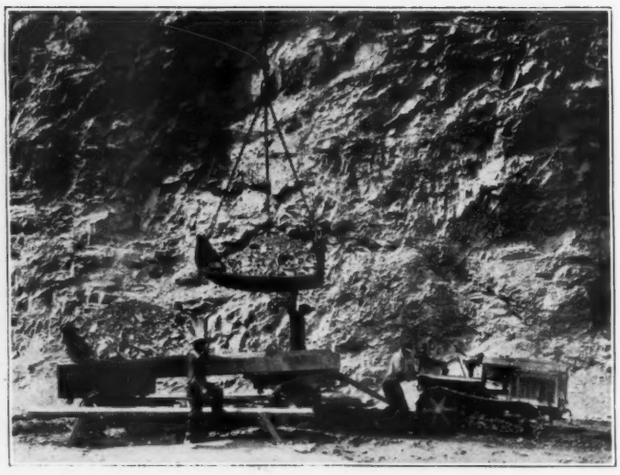
FOLLOWING the trend toward complete plant modernization, an increasing number of companies are rebuilding their plants, scrapping obsolete equipment in favor of the newer and more modern that is engineered to meet present conditions. In the South plant reconstruction is particularly evident, with a noticeable tendency toward the elimination of hand labor. In some instances whole plants have been scrapped to make way for those designed to meet the demand for lower production costs, the final recourse for many companies who wish to remain in business.

One of the most striking examples of the modernization trend is found at Manakin, Va., where the Boscobel Granite Quarries, Inc., have placed in service completely new production facilities from the quarry to the car-loading bins. Operations have been carried on at this site for over 48 years, the old plant at the time of its abandonment having been steam-engine-driven. Following the reorganization of the company on Nov. 15, 1930, when C. S. Luck, Jr., president of the Sunnyside Granite Quarries Co., Richmond, Va., became president, a program of modernization was decided upon. In a record time of less than two months—from Dec. 20, 1930, to Feb. 18, 1931—the new plant was erected and placed in operation. During the same time a complete new system of quarry intraplant transportation was installed. Some idea of the economies effected by these changes can be gained from the fact that 22 men with one shovel in the quarry now produce the same quantity of rock formerly produced by 48 men and 2 shovels. The improvements were planned by Mr. Luck and W. T. Moulton—the latter vice-president and general manager of the company and who was for some years connected with the former company. The new plant has a capacity of 700 tons per day.

Tractor-drawn trailers form the new mode of intraplant transportation in the Boscobel quarry. Here conditions are ideal for tractor hauling, the quarry being relatively small in area. The original quarry floor was located at ground level and operations were directed against a hillside face which reached a maximum height of 160 ft. At this point an area of 6 acres had been opened but, because of the increasing height of the overburden, further recovery of the face was halted. A 50-ft. cut is now being made into the old quarry floor and it is in this and further cuts at lower levels that the tractors are of great utility. There is no incline from the new level to the plant, a derrick serving to raise the 5-ton pans to the jaw crusher. The plant itself is located within a few feet of the quarry ledge.

In its present condition the new quarry floor has a semicircular shape, the derrick position above being at the center. Drilling-and-blasting operations

Loading the blasted rock into the hoist pans.



Hoisting a pan of rock from the trailer.

are carried on in one quadrant of the semicircle without interference with the loading operation in the other quadrant. When blasting, the loading shovel is not withdrawn from its position because it is out of immediate danger. For the hauling of the blasted rock to the hoisting position two International-Harvester 10-20 Tractractors are employed, each towing a Fruehauf trailer carrying a load of 10 tons of rock in two steel hoist-pans. The two tractor-trailer combines travel in approximately a circular path and make an average round trip of 300 ft. under present conditions. In any position of the Erie shovel the average round trip will be the same, since the line of haul is always the radius of a circle, the hoist position being at the center of the semicircle. For loading the pans

The old, steam-driven plant (left), and the new electric-driven operation.

an Erie B-2 1-cu. yd. steam-shovel is used. Prior to the installation of the Fruehauf trailers, wagon-type trailers were employed, and because of their narrow wheels and other inherent deficiencies, the tractors burned approximately 20 gal. of gasoline per day. Since the Fruehauf trailers have been installed, the fuel consumption has been reduced to 12 gal. per day. This remarkable reduction in fuel consumption is attributed to the use of anti-friction bearings and wider rims on the wheels of the new trailer equipment.

Possibly the most significant advantage of the tractor-trailer method of hauling rock as shown from the experience of this quarry is its adaptability. There being no need for the construction of roads on the quarry floor, this equipment can be

The jaw crusher used for primary reduction.

operated anywhere at will—a great advantage in quarry operation where ground is rough and frequent changes of loading positions are necessary. The use of this equipment also allows blasting of rock and subsequent recovery from locations that would otherwise be prohibitive.

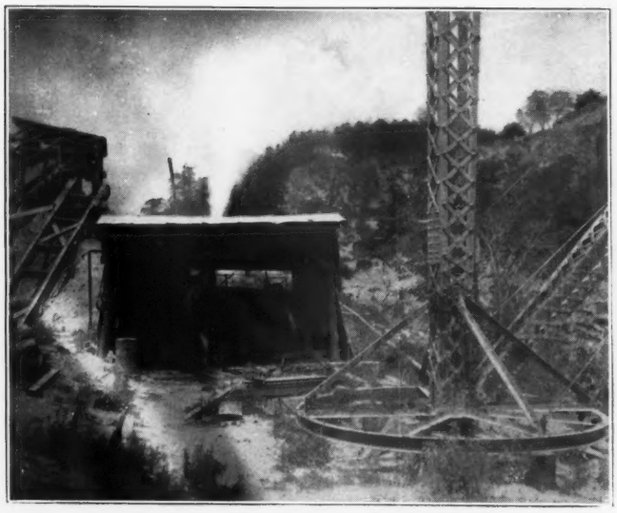
Drilling-and-blasting methods at the Boscobel quarry follow closely standard practice, 6-in. holes being drilled by means of a Loomis Cyclone drill-rig. The holes are loaded with Atlas 50-per cent. nitroglycerine and are detonated by electric blasting-caps. About five holes are fired in the average blast.

The equipment which lifts the blasted rock from the quarry floor consists of an American Hoist & Derrick Co. stiff-leg derrick with a 75-ft. boom and a Lidgerwood hoisting engine. The latter is steam-driven, the only portion of the plant remaining to be electrified. The derrick itself is located close to

the quarry ledge, yet it has access to the primary crusher so that the hoisted pan of rock can be dumped directly into the crusher hopper, and returned to the trailer on the quarry floor without being rehandled.

The primary breaker, a Traylor 28-in. by 36-in. Blake-type jaw crusher, remains in the same position as in the old plant. It is set for 4-in. breakage, and is driven by a 75-hp. motor. All equipment following the primary crusher comprises the new crushing-and-screening plant.

From the primary breaker a 36-in. belt-conveyer, 160 ft. long between pulley centers, delivers the crushed granite to a scalping screen mounted over a bin structure, which provides a uniform feed for the secondary crusher and acts in a limited way as a surge bin. The scalping screen is a 48-in. by 16-ft. rotary-type unit fitted with 2½-in. round-



Hoist and derrick used to raise pans of loaded rock from the quarry.

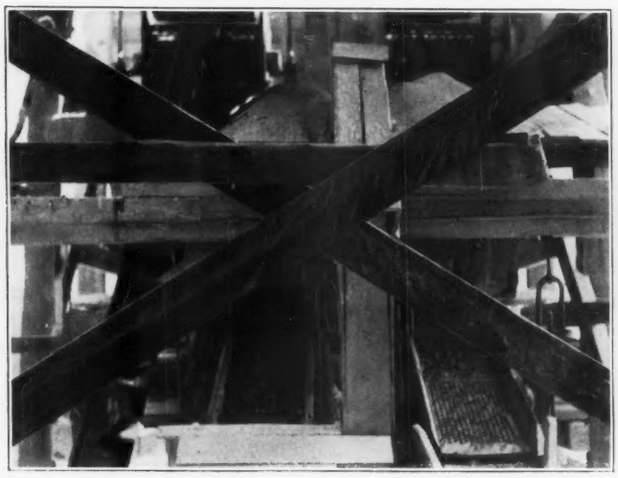
opening, perforated plate, and is driven by a 10-hp. Allis-Chalmers motor.

Adjacent to the feeder-bin on ground level a Symons 4-ft. cone crusher is mounted. This unit, driven by a 125-hp. motor, replaces three crushers formerly required in the old plant for secondary-crushing purposes. The "throughs" from the scalping screen and the crushed material from the Symons unit are spouted to the boot of an Allis-Chalmers 85-ft. belt-bucket-elevator (fitted with 24-in. buckets), which delivers the entire output of the crushing plant to the screening equipment above the car-loading bins.

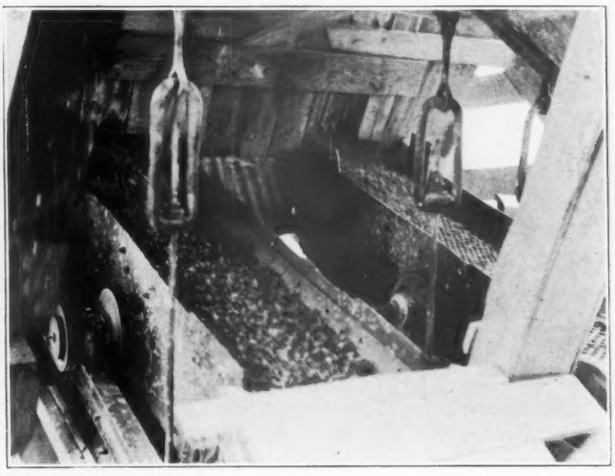
Four Niagara double-deck vibrating screens classify the dry stone. There is a pair of 3-ft. by 6-ft. units for coarse sizing, and a pair of 2-ft. by 6-ft.

Secondary crusher and feeder-bin installation.

units for sizing the fine materials. These screens are arranged so that the discharge from the belt-bucket-elevator is divided, half of the material going to one 3-ft. by 6-ft. screen with its 2-ft. by 6-ft. unit beneath, and the other half going to a similar set of vibrating screens. In this arrangement screen panels can be used to produce two entirely different stone classifications. For example, on one set state-highway-specification materials can be produced, while on the other set commercial stone can be classified. For the production of railroad-ballast stone either one or both sets of vibrating screens can be pressed into this service by the mere changing of screen panels. In a typical screen-panel arrangement the upper 3-ft. by 6-ft. units of both sets will carry 2½-in. mesh wire-cloth panels on their top decks, and 1-in. or 1¼-in.

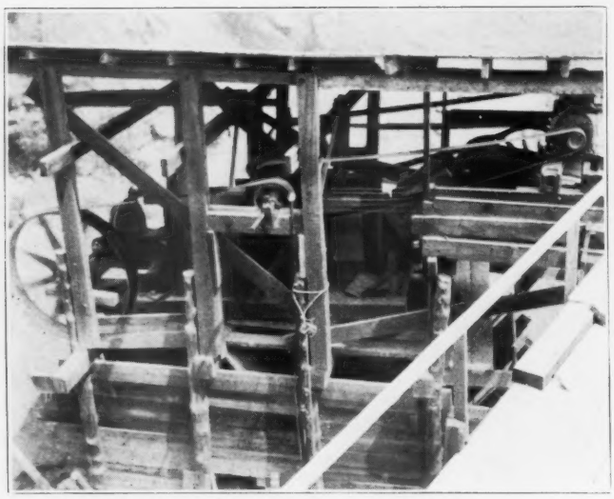


Looking toward the four vibrating screens for dry material.



Vibrating-screen units for sizing of the minus-1-in. material.

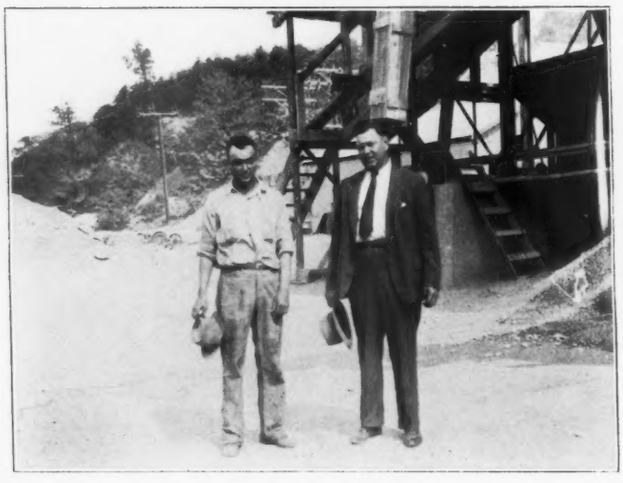
cloth on their bottom decks. One lower 2-ft. by 6-ft. unit will carry ½-in. and ½-in. cloth panels on its top and bottom decks, respectively, while the other unit will carry 1-in. and ¼-in. cloth panels, respectively. Six sizes of crushed granite are ordinarily produced, these being 2½-in. to 1-in., 1-in. to ¼-in., ½-in. to ¼-in., 2-in. to 1-in., 1¼-in. to



Scalping screen and secondary-crusher feed bin beneath.

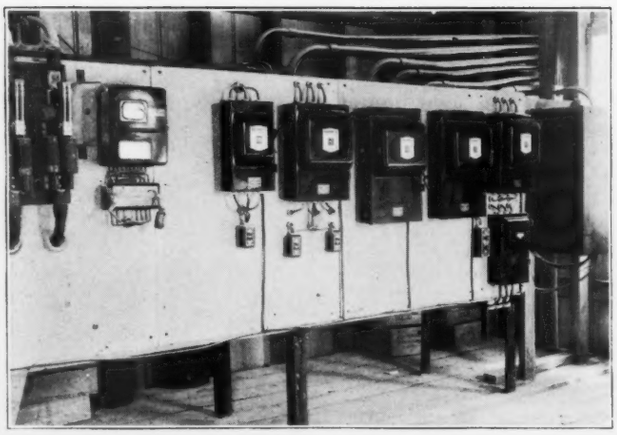
1-in., and ¼-in. to ⅛-in., the last-named being produced by the washing screen over the washed-material storage-bin.

For storing and loading materials, two steel bin-structures were erected, both furnished by the C. S. Johnson Co., Champaign, Ill. The first bin forms the base for the screening equipment and stores dry materials. It has a capacity of 300 cu. yd. in



Left to right: H. C. Crosby, Jr., assistant to W. T. Moulton, vice-president and manager.

its five compartments. Cars can be loaded directly beneath the compartments, a car-loading track extending beneath the structure. The second bin with three compartments stores washed stone. Above it is scrubbing and screening equipment which receives materials from the dry bin by means of an inclined conveyor. This conveyor has a 20-in. belt 120-ft. long between centers and receives materials from bin-gates on the side of the dry-ma-



The power-distribution panel.

terials bin-structure. The scrubbing equipment consists of a revolving cylinder of standard construction which discharges directly to a jacketed screen, which produces a washed ¼-in. to ⅛-in. material. Any size stone can be scrubbed and and washed prior to shipment. The washed materials can be loaded direct to cars or to trucks.

The plant is served by the Chesapeake & Ohio Railroad, a main line passing by the Boscobel property. A single side-track, sufficient to handle 80 cars under gravity movement, serves the loading bins.

To complement the modern processing equipment of the new plant, an equally-modern system of electric-power distribution and control has been installed. Power is received in a separate building and is distributed from a single switchboard. Here a fused main-line switch is mounted and, in order, a recording watt-hour meter, a demand meter, and individual departmental fused safety switches. Each motor has a 3-station push-button control, being under control from the motor position, a centralized department, as well as the main distribution panel. Motors are started in series; that is, the last processing operation is started first, followed by each unit to the primary crusher.

Several equipment items are standardized throughout the plant, among them being Dayton Rubber Co. conveyor belting, Link-Belt idlers and return-rolls, Allis-Chalmers motors, and Square D switches.

Future plans for the quarry development indicate that further operations on the existing 160-ft. ledge will be made. The 24-ft. overburden will be hydraulicked and washed into a creek on the opposite side of the hill. This will then allow drilling and blasting of a 210-ft. ledge.

ONE of the most modern crushed-stone plants in the South is the new Camak, Ga. operation of Weston & Brooker Co. Other producers can benefit from this plant's processing methods by reading the story of it's work beginning on page 45.

A view of the new Weston & Brooker plant at Camak, Ga.

Motor Trucks Haul Stone to New Georgia Plant of Weston & Brooker Co.

Third Producing Unit of Noted Southern Operator Has 2,000 Tons Daily Capacity

By MAT F. BEISBER

THAT few new plants were erected during 1930 is only too well known by the mineral-aggregate industry. Because of that fact, our attention is all the more focused on the ones that were erected, to see what new methods of handling materials were devised and to learn of the success any new equipment installed therein attained.

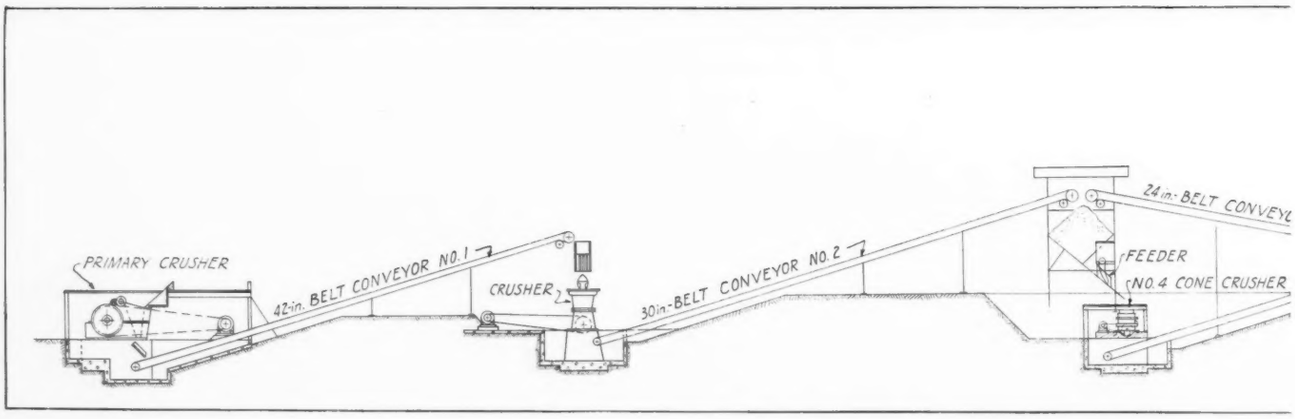
One of the outstanding plants of 1930 in the southern part of the country was built at Camak, Ga. Being located in a region which promises much in the way of development, with a large program of road construction planned for the future, this new plant is in an excellent position to serve it.

The Weston & Brooker Co., with headquarters at Columbia, S. C., owns and operates the new plant which is its third unit, the others being located at Cayce, a suburb of Columbia, S. C., and Parkhill, S. C. The Camak unit was designed by W. S. Weston, vice-president and chief engineer of the company. H. L. Bynum, engineer assistant to Mr. Weston, executed the plans and acted as resident engineer during the course of its erection. The plant was designed to produce 2,000 tons of finished materials during a 10-hr. period.

The Camak plant embraces several features which are certain to attract considerable interest throughout the South. With the quarry rock being hauled to the plant by motor trucks, the material is processed in a straight-line flow through the plant. Within the plant is found an unusual use of a derrick at the primary crusher and a vibrating-screen arrangement which deserves inspection. Likewise Mr. Weston's storage-bin and stock-piling design offers something new in crushed-stone practice.

The Camak operation, under the superintendence of T. R. Jamison, is located on a site comprising 146 acres of wooded land, part of which is a natural hollow. In the bottom of the hollow the plant was built—an admirable location both from the railroad access point of view as well as from the quarry point of view. A 4-mi. spur-track connects the plant with the Georgia Railroad.

Arriving at the plant via automobile, the visitors pass by a reservoir located at the highest point of the property, which is approximately 100 ft. above the ground level at the plant and quarry-floor. Storing 6,000,000 gal. of water within its earthen wall, this reservoir protects the company from a possible shortage of wash-water during the dry season, usually the months of July, August and September. A stream flowing through the plant meets the normal water requirements. Two Allis-Chalmers centrifugal pumps, one with a capacity of 300 gal. per min. at a 165-ft. head, the other 100 gal. per min. at the same head, pump water from

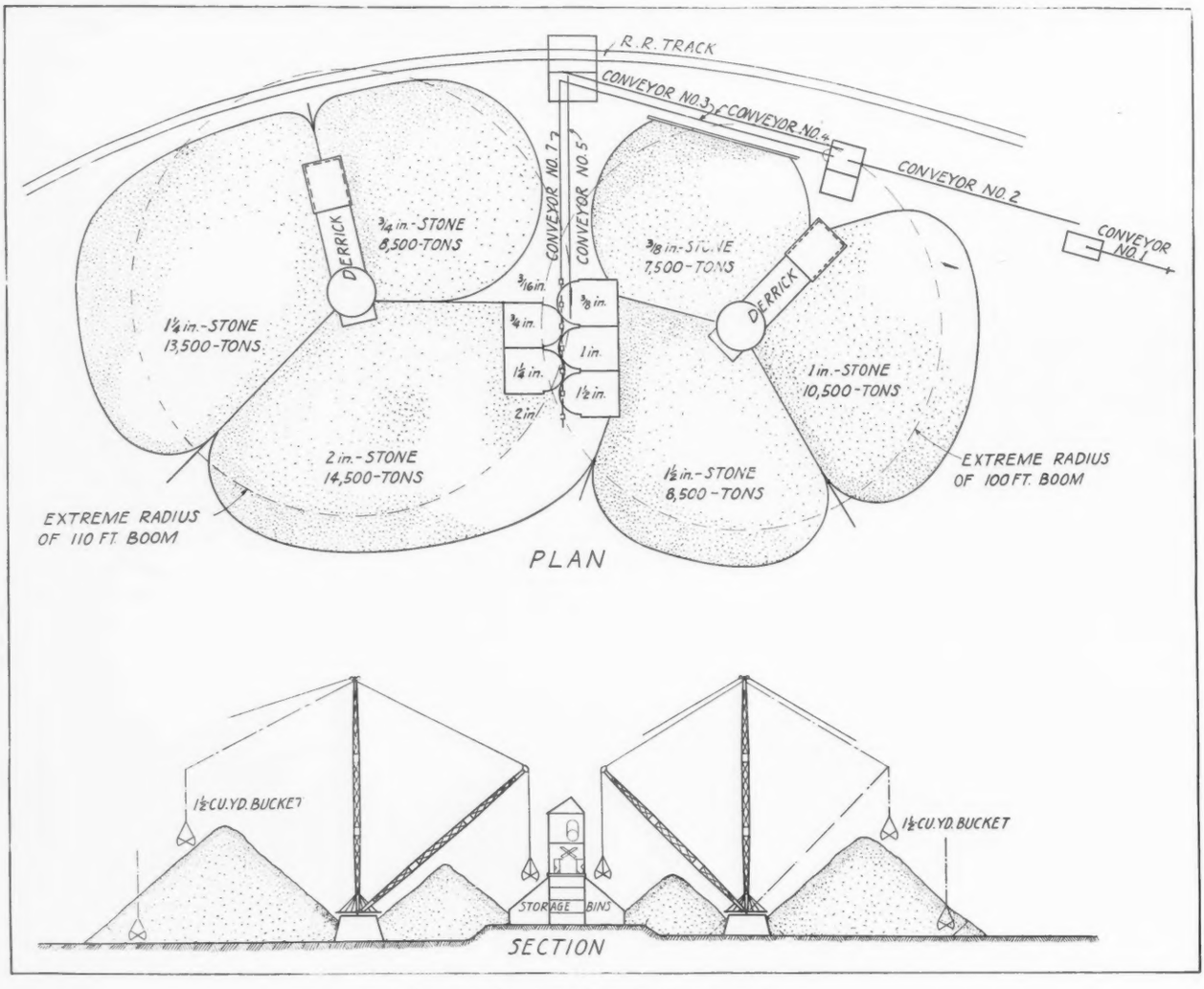


Running elevation of processing operations at the Camak,

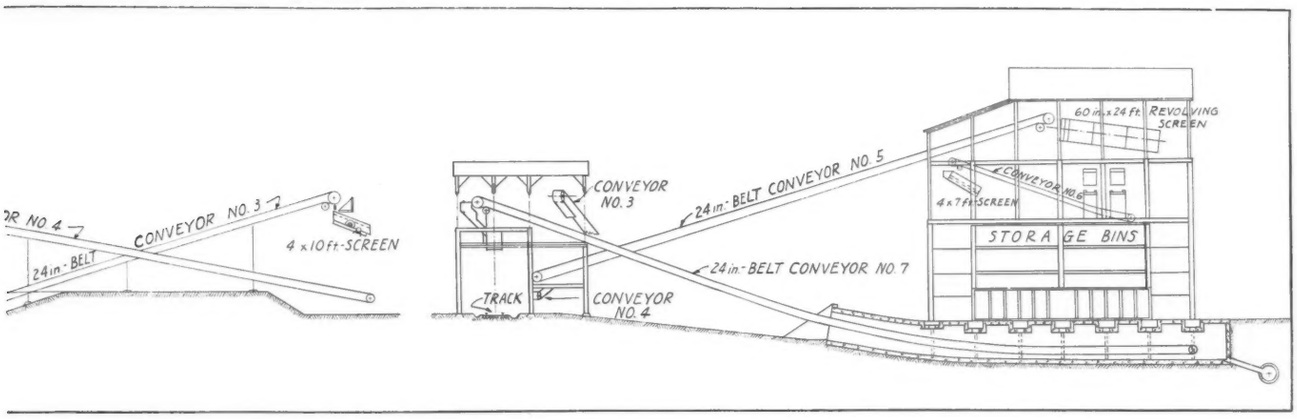
the creek to the reservoir. A 100,000-gal. reservoir was in use during the construction of the larger one.

Initial quarry operations were made from the floor of the hollow directly into the sloping bank. At present the quarry face is approximately 50 ft. in height. At its maximum height, the face will measure approximately 100 ft. The light overburden, which varies in depth from 0 to 3 ft., is stripped by a shovel and removed by means of motor trucks. Much of this material was used in the construction of the reservoir. Nearly 15 acres of the deposit has no overburden.

Two well drills, one a Keystone, the other a Loomis "Clipper," are kept busy drilling 6-in. holes for blasting the granite. These holes are drilled on 25-ft. by 18-ft. centers at the average rate of 50 ft. per day per drill. No definite make of dynamite



Plan and elevation of stock-piling operations.



Ga., crushed-stone plant of Weston & Brooker Co.

has been chosen by the company, the business being divided among four of the leading manufacturers, including DuPont, Hercules, Atlas and the Burton. The granite deposit responds well to blasting as there are no seams, clay-holes, or faults. Experience has shown that better fragmentation results when the blast holes are drilled along a curved line. The holes, which then cross certain strata planes allow the explosive to shatter the larger boulders which would otherwise result from straight-line drilling. For secondary shooting 10 Ingersoll-Rand Jackhammers and 3 tripod drills are kept on hand. Two Sullivan air-compressors located in a building adjacent to the blacksmith-shop,

Dumping a truck body with the stiff-leg derrick.

supply the compressed air. These compressors are of the 2-cylinder right-angle type, one having a capacity of 1,200 cu. ft. per min. and being driven by a Westinghouse 200-hp. motor, the other having a capacity of 800 cu. ft. per min. and being driven by a General Electric 150-hp. motor.

The blasted rock is loaded by means of two Marion steam-shovels, one a No. 480, the other a No. 37, both having 2-cu.yd. dippers. Four Mack 7½-ton trucks, each equipped with an Easton 8-cu.yd. steel body, haul the rock to the jaw-crusher hopper. The round trip for each truck at the present time is approximately 1,000 ft. over the quarry-floor. This road will be paved with granite blocks to make it satisfactory for use even in extremely wet weather. Two trucks are assigned to each shovel. With a quick method of unloading in use at the primary crusher, the movement of the trucks is quite steady. Delays and tie-ups are exceptions to the rule when the plant is running normally.

To shorten the haul from the quarry to the plant, the primary crusher and the two secondary crushers are placed in a line extending from the screening-house toward the quarry. Thus the plant becomes L-shaped—well adapted to the hollow in which it is built. At the same time huge stock-piles can be built on opposite sides of the storage-bins without interference from the car-loading tracks, the elevators, or the conveying equipment.

An Allis-Chalmers 48-in. by 60-in. jaw crusher acts as a primary breaker. It is mounted in a pit, so that the trucks unloading into its hopper remain on the quarry-floor level. A 200-hp. motor operates the crusher through a belt drive.

The system used to unload the trucks is one of the features of the plant. An American Hoist & Derrick Co. stiff-leg derrick, with a 35-ft. mast, is located between the truck-unloading platform and the secondary crusher. Being equipped with a 75-ft. boom this derrick not only dumps the truck bodies, but is able to handle repair parts for both the primary and secondary crushers and to unload such parts from the car-loading track alongside. This unusual facility safeguards the crushing-machinery division of the plant and becomes of inestimable value when repairing or overhauling is

The yard-service crane at work on the stock-piles.

One of the well drills at work on the quarry ledge.

being done. For dumping the truck bodies, the boom is held in a fixed position over the unloading platform. A 2-rope tackle, the head-pulley being at the boom's end, is equipped with a heavy iron hook fixed to the movable pulley. The movable pulley, however, is held by a horizontal wire-rope fastened to the mast. Thus, when the hook is raised, it travels in the path of an arc of a circle, following the movement of the overturned truck body instead of tending to lift the body straight up in the air.

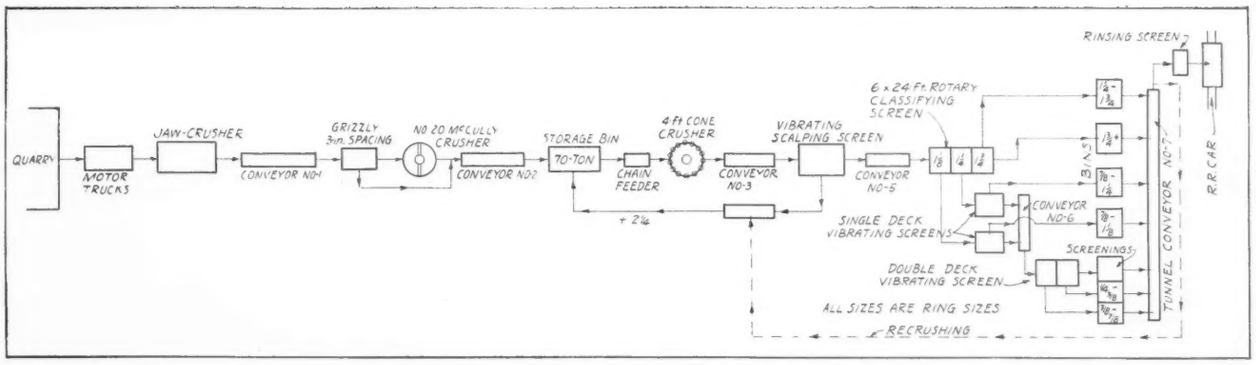
Material from the primary crusher falls to the first of a series of conveyors which carry it through the plant. The first unit, No. 1, has a 42-in. belt, 110 ft. long on horizontal travel. Goodrich belting and Link-Belt Timken-equipped idlers and return-rolls are standard on all conveyors. Conveyor No. 1 sends the material to a grizzly mounted beneath its head-pulley. The grizzly is made up of a series of manganese-steel bars, spaced 3 in. apart to allow fine material to pass directly to conveyor No. 2. All stone retained on the grizzly falls directly to an Allis-Chalmers 20-in. McCully crusher which is set at 3 in.

Conveyor No. 2 receives the minus-3-in. material and transports it to a 70-ton steel surge-bin, at the foot of which a Symons 4-ft. cone crusher is located to handle the final or secondary crushing. A con-

A close-up view of the washing-screen house.

tinuous flow of materials through the screening plant is assured through the use of the surge-bin, as sufficient materials are temporarily stored at this point to supply the screening equipment for at least 15 min. Thus any temporary delay at the quarry or in the primary-crushing division is compensated for. Likewise the screening equipment can be temporarily shut down without involving

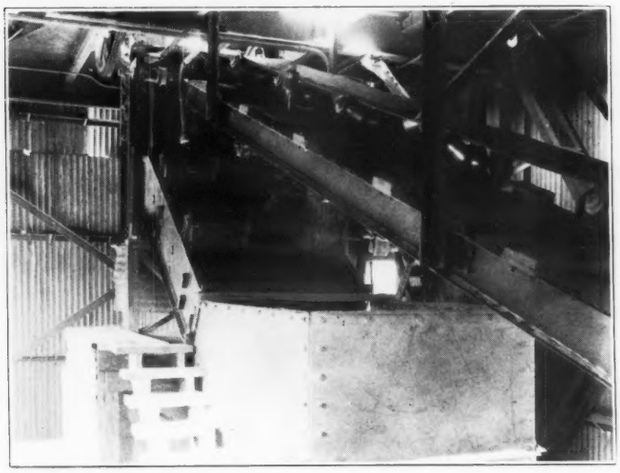
Two shovels beginning to work in the quarry shortly after a blast.



Flow-sheet of the crushed-stone plant operations.

the quarry operations. Conveyor No. 2 has a 30-in. belt 120 ft. long on horizontal travel.

Material from the surge-bin is fed to the Symons crusher by means of a Ross chain-type feeder. The crusher, which is driven by a 100-hp. motor, is set for 2¼-in. breakage. From the Symons unit the material is carried on conveyor No. 3 to a Niagara scalping-screen located in the car-loading building, which serves both as a transfer house for incoming material and as a washing-screen house for loading the finished materials into the cars beneath. Conveyor No. 3 employs a 24-in. belt with a 130-ft. horizontal travel.



Conveyor which brings the small sizes of stone to No. 3 vibrating screen, below.

The Niagara vibrating screen located at the head of conveyor No. 3 is a 4-ft. by 8-ft. unit with a 2¼-in.-mesh wire-cloth deck. Rejected material from it returns to the surge-bin via conveyor No. 4, which is a return-circuit conveyor with a 24-in. belt. "Throughs" from the scalping-screen are taken to the screen-house on conveyor No. 5. The latter unit also has a 24-in. belt with a 130-ft. horizontal travel.

Three vibrating screens and one rotary screen are employed at the Camak plant to classify the crushed stone. The rotary screen acts as a primary separator, sending two sizes to the vibrating screens for final separation and two sizes directly to bins beneath. The revolving screen is a 60-in. by 24-ft. unit equipped with three sections of perforated plate having openings of the following sizes: 8 ft. of 1⅛-in., 8 ft. of 1¼-in. and 8 ft. of 1¾-in. The material passing the 1⅛-in. screen is sent to a Tyler Hum-mer 4-ft. by 7-ft. vibrating screen which has a ⅞-in. deck. The second section of the revolving screens sends its "throughs" to another Hum-mer screen, which has a single deck equipped with a ⅞-in. wire-cloth panel. Beneath these two screen units is a conveyor, which sends the minus-⅞-in. material to the top deck of the third vibrating screen, which produces three sizes of materials; ⅜-in. to ⅞-in. on its top deck, ¼-in. to ⅜-in. on its bottom deck, and minus-¼-in. screenings. The second Hum-mer screen produces ⅞-in. to 1⅛-in. stone and the first Hum-mer ⅞-in. to 1¼-in. stone. The third section of the revolving screen sends 1¾-in. material directly to a bin, and the plus-1¾-in. material likewise goes to a bin.

Possibly the chief advantage in this arrangement lies in the fact that the conveyor, which sends the minus-⅞-in. stone to the No. 3 Hum-mer screen, allows a reduction in the height of the screening building of at least 15 ft. All three vibrating screens are located on the same floor, and the conveyor is but 40 ft. in length. Another advantage in this system is the fact that, through the use of the revolving screen, the vibrating screens are handling materials more nearly to the required finished size being freed of excessively large stone.

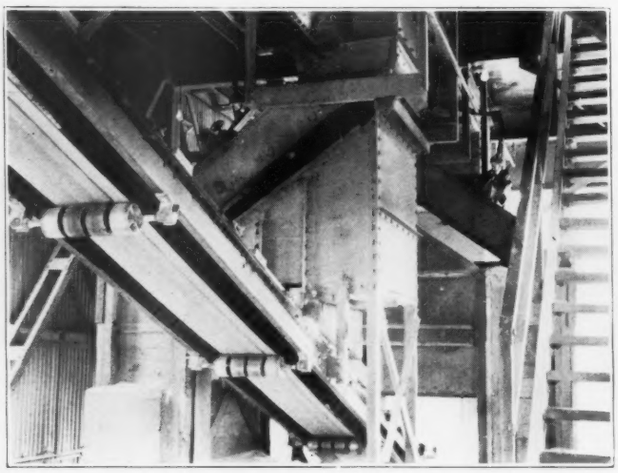
Another interesting phase of this new Georgia plant is the design of the storage-bins. There are

The open-top bins provide access for the clam-shell bucket.

five bins, three on one side and two on the other, with a tunnel-conveyor beneath and between them. A bird's-eye view of one of the bins would disclose it as having a D shape, consisting of three sides of a rectangle with the fourth side an arc of a circle. An elevation view of the side of a bin would show it to be a rectangular figure with the left-hand corner cut off. The unusual shape of these bins offers several advantages. Because of the circular ends, the two bins on one side are nested into the three bins on the opposite side, giving each bin

T. R. Jamison, plant superintendent, and H. N. Bynum, assistant to W. S. Weston.

access to the tunnel-conveyor beneath. The sloping sides of the bins allow a crane or the derrick clam-shell bucket to relieve a loaded bin of its excess material to create exterior stock-piles. Each bin has a length of 29 ft. and a width of 22 ft.; the curved end has a radius of 11 ft. The front end is 8 ft. high and the back (curved) end is 24 ft. high. Each bin has a capacity of 150 tons of material available for the tunnel-conveyor belt. Its total storage capacity is approximately 350 tons.



Vibrating screens No. 1 and No. 2 and conveyor which carries "throughs" to No. 3 screen.

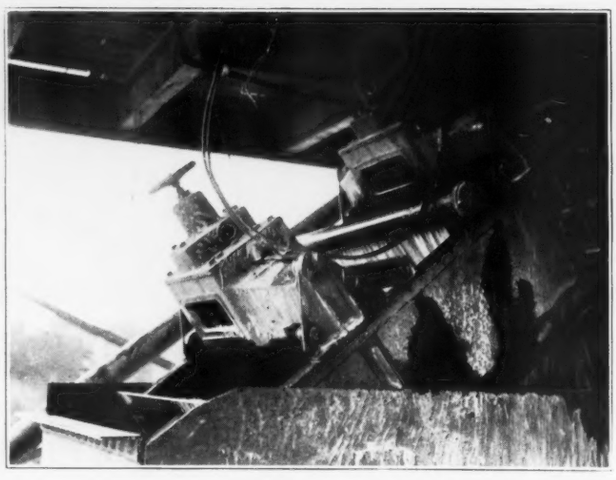
As stated, a tunnel-conveyor reclaims the crushed stone from the storage-bins. It also has access to 2 ground-storage piles adjacent to the storage-bins. The tunnel-conveyor (No. 7) has a 30-in. belt and has a horizontal travel of 180 ft. It leads directly to the car-loading building, where the

The secondary crusher and the grizzly-screen house.

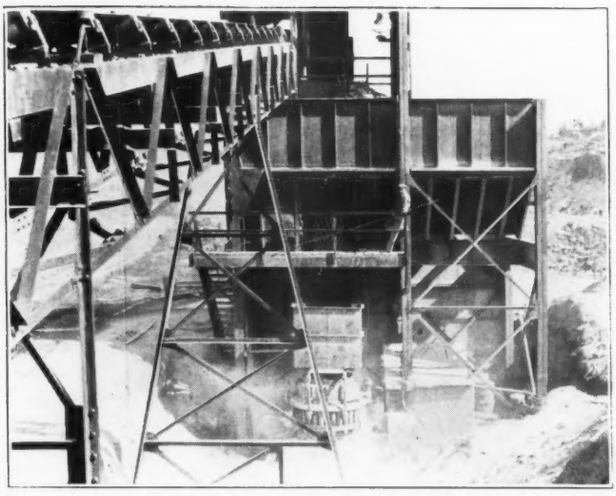
material is sent over a 5-ft. by 10-ft. vibrating-screen on which a series of jets send 350-gal. of water per min. over the stone as it is chuted to the cars beneath. A reciprocating mechanism spreads the stone evenly across the car body.

Should it be desirable to recrush stone stored in any of the bins, a flip-gate at the head of the tunnel-conveyor belt transfers the material to the return-circuit conveyor-belt which, in turn, takes it back to the surge-bin. Then the Symons crusher can be set to the desired size and the material can be recrushed and sent back to the screening equipment, thence into the bins. Another method of returning stocked material for recrushing will be described in connection with the ground-storage system.

The lay-out of the storage-bins and the plant in general takes advantage of the natural hollow, in that two large circular-shaped stock-piles will be created, one on each side of the storage-bins. By means of a derrick on each side materials will be taken from the bins in 1½-cu. yd. clam-shell buckets and transferred to the piles. These derricks will have masts 115 ft. in height with booms no less than 100 ft. long and will be located in posi-



The rinsing screen in the car-loading building.



Surge bin and cone crusher. Note chain-type feeder.

tions which will allow the building of piles of maximum capacity. The derrick, which will face the three bins on one side, will be able to transfer materials from them to the surge-bin for recrushing purposes. Surrounding each derrick will be three piles of materials. When required, the stocked material can be returned to the storage-bins for loading into the cars. A total of 63,000 tons of stone will be stored in the 6 piles when the system is completed and in operation.

For yard service, a P&H crane equipped with a Hayward 2-cu.yd. bucket serves the plant as a general utility and stock-pile machine. The car-moving and switching are handled by a Porter 18-ton locomotive.

Two other features of the Weston & Brooker

The 6,000,000-gal. reservoir showing the earth-wall construction.

plant are found in the building construction and in the electrical-control equipment. The entire conveyor system is built of fabricated structural-iron shapes. All buildings are likewise built of structural-steel inclosed with galvanized corrugated-iron siding. In the screen-house even the floors are made of steel plates welded together. Stairways are all of steel and well guarded. Permanence and freedom from the maintenance and fire hazard of wood construction are achieved through the use of steel and concrete.

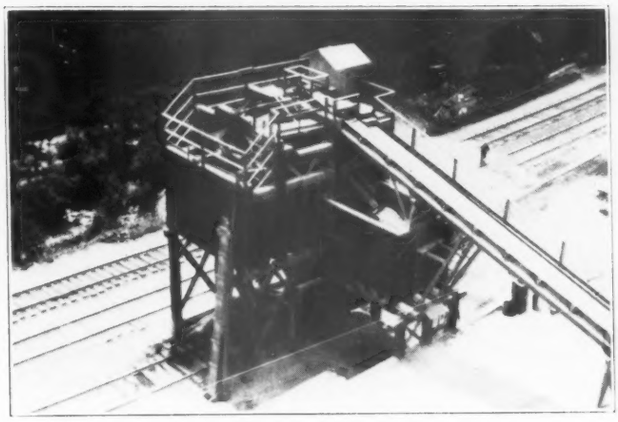
A remote-control system features the electric-control apparatus. While each mechanical unit can be individually controlled, one man stationed at a panel of push-buttons on the top level of the screen-house starts each unit in order from the screening equipment to the crushers with the exception of the primary crusher. The operator from his position in the screen-house has a full view of the entire plant operation.

Tunnel Conveyors Recover Material

(*Continued from page 40*)

ratchet-and-pawl mechanisms to prevent back-sliding.

An interesting "wrinkle" in the distribution of water to the air-compressor and the steam-shovel



Looking down on the car and truck-loading station.

has been worked out by J. M. Pirkey, superintendent. The air-compressor, being located on the hillside adjacent to the quarry, was high enough to add a considerable head to its cooling-water dis-

Truck dumping stone to crusher hopper. Air hoist at the left.

charge. Accordingly, Supt. Pirkey built the plant's gravity tank near the compressor house. This tank supplies the compressor, and the discharged water from the latter is piped to the quarry, where it supplies the shovel and other quarry utilities. In so doing the cooling water is not wasted, and the heat of cooling is saved, since the water is used as boiler-feed water.

The Essential Properties of Portland Cement and Their Consequences*

By ANGELO LILI, Doct. Ing.
General Manager, Val di Setta Lime & Cement Co., Bologna, Italy

PURE Portland cements of high quality should have certain properties which may be considered fundamental, and which may be summed up in this fashion:

(1) Constancy of volume; (2) minimum quantity of mixing water; (3) slow set during the first twenty-four hours; (4) minimum shrinkage; (5) high strength at 7 days, with considerable increase from 7 to 28 days; (6) highest possible ratio between the tensile and compressive strengths; (7) highest possible ratio between the strengths obtained in the concrete and those obtained in the standard mortar; and (8) high density.

Control tests should have it as their purpose to determine that all cements possess these fundamental properties, and in what measure. Consequently it should be indispensable that these control tests, remaining what they are to-day, should be interpreted in a different manner, so that conclusions can be drawn from them that are more clear and, as far as possible, more applicable in practice.

Putting aside at the outset that which concerns constancy of volume, if we examine the properties mentioned in points 2, 3, 4 and 5 we see that they depend on the hydraulic modulus and the silicic modulus chosen for the chemical composition of the cement material, and, in particular, on the limited quantity of iron and aluminum oxides. The limitation of the content in oxides (especially in alumina) makes it possible to enrich the cement with silicates of lime, which constitute the element most necessary for obtaining high strengths, both in tension and in compression in the case of the standard mortar and in compression in the case of concrete; it avoids the absorption of large quantities of mixing water and too rapid hardening of the mortars; it favors large increases in strength after 7 days; it can reduce the shrinkages to zero.

At the same time, slow set during the first 24 hours after mixing must not be obtained at the expense of the strength of the concrete after 7 and 28 days, because, with a good proportioning of the components, it is possible to obtain both a slow set, and a strength of the concrete not inferior to that obtained from cements which permit the removal of forms after a very short time.

The great advantage won either by the limitation of the oxides, or by enriching in silica, or by a moderated hydraulic modulus, are brought into focus when we consider the following facts: with cements thus composed, we obtain increases in strength from 7 to 28 days which are never less than 50 per cent. It is to be noted, too, that there is a high ratio between the results of tensile-strength tests and those of compressive-strength tests, and likewise between the results of tests on concrete and those of tests on standard mortars.

For this reason, if we wish the tests on the standard mortars to give a more exact idea of the real value of a cement, it is absolutely necessary to consider the relation between the strengths after 28 days and those after 7 days; that is to say, to conclude that the strength which a cement must yield at 28 days must not be lower than the result obtained by multiplying the strength of the same cement at 7 days by a coefficient of increase.

That admitted, if we call R' and R'' the strengths obtained after 7 and 28 days, respectively, and a the coefficient of increase we would always have

$$R'' \geq R' \cdot a$$

Consequently, it would be necessary to study and determine the coefficients, increasing in numerical value, all the way from those applicable to the cements of lowest quality to those suited to the cements of highest quality.

To perpetuate the system followed up to the present, which consists in taking as a basis minimum figures for the strengths after 7 and 28 days, means, oftentimes, approving the use of cements which should not be recommended, and neglecting all principles of logic.

On the other hand, when we examine the properties concerned in points 5, 6 and 7, we see that if we consider the increases in strengths and those in the ratios between the tensile and compressive strengths, as well as the ratio between the strength of the concrete and that of the standard mortar, it is possible to work out a formula from which results a number which gives a very close estimate of the value of a given cement.

If we indicate as T' and T'', C' and C'', the tensile and compressive strengths, respectively, after 7 and 28 days, we can have through the following formula an

$$\textit{Index of quality } J = \frac{C''}{C'} \times \frac{T' + T''}{C' + C''}$$

Then, if we multiply J by the compressive strength of the concrete after 7 days K', there is obtained:

$$J \times K' = J_r$$

which is the *strength index* of the cement in question.

The index of quality J can be the same for differ-

*Presented at First International Congress of the New International Assn. for Testing Materials, Zurich, Switzerland, Sept. 6-12, 1931. Translated from the French.

ent cements, that is, for cements which behave in the same fashion, regardless of the particular strengths involved.

The strength index J_r gives a good criterion, highly important in practice, because it takes account of the strength of the concrete after 7 days, that is, of the concrete tested under the most unfavorable conditions, especially in the case of slow-setting cements.

I do not know whether this way of evaluating a cement can be approved by all who are occupied with the question; however that may be, I am putting the question and I should like very much to have it considered and also to have some study given to see whether it is possible to propose a better formula, capable of giving the most complete idea of the real value of a cement.

The index of quality, calculated on the basis of the properties mentioned in points 5, 6 and 7, will be the index of high increases of the strengths of concretes and of the long duration of increase, the index increasing in proportion with these properties.

All that I have written above is the fruit of observations, made in the course of many years, and in the process of manufacturing, on the variations of the properties of cements in relation to the variations of their composition.

Also, as I had the privilege of communicating a short time ago to the Thirteenth Congress of the Italian Assn. for the Study of Construction Materials, my observations have been confirmed by the results of investigations undertaken by experimenters of all countries.

We thus reach the following conclusion: Cements will satisfy the requirements of practice, and will possess the fundamental properties presented at the beginning of this paper, in greater measure as we are able to limit the proportion of lime and attain the lowest possible silicic modulus.

The example below, in addition to that which I presented at Rome, will give an idea of the truth of my assertion.

Strength of Standard Mortar with Pure Cement

		Age in Days				
Requirement		3	5	7	28	84
Tension	(kg/cm²)	22.7	26.6	30.5	39.7	49.8
Compression	(kg/cm²)	198	279	326	516	796

This cement had a fineness corresponding to a residue of 4 per cent. on the screen of 4,900 mesh per sq. cm. (about 175 mesh per lineal inch).

$$\text{Hydraulic modulus} = \frac{CaO}{SiO_2 + R_2O_3} = 1.843$$

$$\text{Silicic modulus} = \frac{SiO_2}{R_2O_3} = 4.31$$

$$\text{Ratio of the oxides} = \frac{Al_2O_3}{Fe_2O_3} = 1.84$$

The proportion of mixing water was 23.5 per cent.

The cement commenced its set after 4½ hours and finished the set after 12 to 14 hours.

The concrete produced (near Bologna, Italy) with sand and gravel from the Rhine, yielded the following compressive strengths:

After 7 days 221 kg/cm².

After 26 days 294.1 kg/cm².

If it is desired to achieve the same results with cements rich in lime and in alumina, there are obtained in the tests on the standard mortar exaggerated compressive strengths at 7 days, and very low tensile strengths. There is also danger that the cement may contain lime in solid solution, which necessarily leads to later decreases in strength, or at least a premature end to the increase in strength.

The excess of lime also augments the quantity of soluble salts, and by that fact, the cements become less suited to all uses, particularly in cases where the concretes are to be in contact with aggressive fresh water or with sea water.

Formerly, when the Dietzsch and Aalborg kilns and those derived from them, as well as rotary kilns of comparatively short length, did not permit the attainment of perfect clinkering, there was no motive for troubling much with the less favorable chemical compositions which might be adopted for making cement. The low temperature for burning which it was possible to obtain in them made it necessary not to have an excess of oxides, because one fell in danger of rapid set; it made it necessary not to have an excess of lime, for there resulted from it free calcium oxide and, consequently, a certain variability in volume.

Remaining within the limits imposed by necessity, the manufacturers produced cements which made it possible to obtain very good concretes, although without giving high strengths in the tests on standard mortar.

At present, the very high temperature which can be obtained in the modern kilns makes it possible either to saturate with lime relatively high quantities of alumina, or to render innocuous, at the outset, the excess of lime, still yielding regularity of set, constancy of volume and very high initial strengths.

This mirage has deceived everybody, even the constructors who, for the sake of rapid removal of forms, have led the industry to the production of cements having initial strengths always higher and higher, without troubling themselves about the later increases.

All that is dangerous and illogical. It is profiting from the improvements in technology, not to improve the cementing materials, but to make them more imperfect. So it is with the object of eliminating this error that I have taken the liberty of proposing that we evaluate in another manner the results given by the tests on the standard mortars and that we determine an index of quality.

The timeliness of this proposal will be apparent when one has observed the experimental results obtained with cements of low basicity, with a high

silicic modulus, and has examined either the high strength of the concretes at 7 and 28 days, or the high ratio that exists between the tensile and compressive strengths in the standard mortar, or finally the strength which they attain after 210 to 365 days, which is much higher than that given by cements rich in lime and in oxides.

For these reasons, we should aspire to the production of cements of slow set at the beginning, which permit, because of the very high strengths of their concretes after 7 days, the removal of forms after a short interval (which would not be longer than that in the case of cements with high initial strengths). These cements attain in the long run strengths much higher than those which are obtained with cements giving at the beginning very high strengths in the tests on the standard mortar.

All this can not be obtained unless we reduce to a minimum the proportion of the active elements and of those which oppose the phenomenon of setting and which end up by making it less efficacious and even, in time, by destroying it.

Such cements can only have a very high density: always above 3.05.

Concerning the addition of foreign materials to Portland cements, I assert that this custom is not to be recommended. It is not satisfactory on the ground of lowering the net price of high-quality cements, for the best organized plants can produce the best cements, attaining the double end of producing well and producing cheaply. Neither is it satisfactory on the ground of lowering the too-high strengths which the best cements can yield from 7 to 28 days, for that is to the detriment of the jobs, as can be seen by observing the tests on test specimens in standard mortar after 28 days.

In this connection, I am presenting below the results which I have obtained up to 210 days in testing the same cement mentioned previously, but ground in such a way as to give a residue of 10.5 per cent. on the 4900-mesh sieve. I give first the results of the mortar made with the pure cement (without admixture) and then the results of the mortar prepared with the same cement with the addition of 15 per cent. of inert materials.

Requirement	Age in days					
	3	5	7	28	84	210
Standard mortar with pure cement						
Tension (kg/cm²)	18.6	21.2	26.1	37.2	46.3	50.0
Compression (kg/cm²)	150	214	242	416	620	800
Standard mortar with cement with 15% admixture						
Tension (kg/cm²)	18.1	22	25.7	31.3	43.1	
Compression (kg/cm²)	175	229	246	414	547	

From these figures it is seen that *an initial improvement is followed by a greater and greater drop.*

We must not give ourselves any illusions: The addition of inert materials is harmful, even if they are added in small quantities. You can imagine whether they are so when added in great quantities, as is customarily done by many manufacturers.

But the greatest harm caused by the adding of inert materials comes from:

1. Changing the ratio of *water to cement* in the concrete; and
2. Facilitating shrinkage.

The ratio of water to cement in the concrete is forcibly altered, because anyone who uses cement proportions the water to the quantity of the cement, while he ought to use a much lower quantity of it when he is working with mixed cements. And because of the excess of mixing water, a decrease in the strength of the concrete is produced.

Shrinkage, which can be at its minimum only in the case of concretes produced with slow-setting cements, requiring low quantities of mixing water, becomes considerable in the case of concretes made from cement produced with an excessive quantity of mixing water. In fact, the excess of water, which does not take part in the phenomena of dissolution and crystallization but which is retained in the earlier periods by the inert materials added to the cement, subsequently evaporates and, in its place, leaves a void which produces fissure.

Thus purely technical reasons obtrude to banish absolutely the addition of inert materials.

Finally, I am going to consider the addition of materials containing silica in combinable form (puzzolana, trass, Si-Stoff, etc.).

In the case of these materials, if one wishes a perfectly clear idea harmonizing with what I have said concerning the adding of inert materials, it is necessary for the materials containing combinable silica to be placed on the market separately, never mixed with Portland cements. If it is desired that Portland cement be used scientifically by builders who know perfectly well what they are doing, it should be delivered to them absolutely pure.

Then if, in the course of its use, the contractor decides that the addition of materials containing hydraulic silica to the concrete is appropriate, the industry can furnish them to him, finely ground and with an indication of the percentage of hydraulic silica which they contain.

Mixing with Portland cements materials containing given percentages of hydraulic silica, but generally containing also quite high proportions of inert ingredients, is to engender confusion and mistakes, especially as regards the relation of *water to cement* during the production of the concrete.

Summing up, the cement industry should strive to furnish to the trade cement materials of slow set, having high tensile and compressive strengths, with high increases in strength, and permitting the removal of forms within a short time. The interpretation of control tests should be such that it makes sure that the cements have the qualities above mentioned. Portland cements should always be manufactured and delivered pure, never mixed, neither with inert materials, nor even with materials containing hydraulic silica. The materials containing hydraulic silica should be placed on the market separately and finely ground.

Five well-drills at work on the deposit. Ncte the close grouping of the rigs.

Producer of Ballast Adds Equipment for Processing Commercial Stone

Trego Stone Corp. Fills 800,000-Cu. Yd. Ballast Order for Atlantic Coast Line

DESPITE the general decline in railroad-ballast business the country over, a good number of aggregate producers are getting and holding large contracts for this class of business. One plant of a nationally-known producer is in capacity production on an 800,000-cu. yd. ballast order, begun following the completion of a 1,000,000,-cu. yd. contract with theAtlantic Coast Line Railway.

These contracts awarded the Trego Stone Corp., Skippers, Va., form the bulk of its business. In fact, the plant was designed specifically for large-scale ballast production with provisions made for the installation of additional crushing-and-screening facilities for commercial stone. In 1930 such facilities were added while the plant was in the midst of its largest ballast order, indicating that its market is not entirely dependent upon the railroads.

The Trego Stone Corp. is a division of the W. W. Boxley Co., Roanoke, Va., and is one of the latter company's four plants, all which are located at strategic points in Virginia. The Trego plant was erected during the winter of 1926-27 from the plans of the Allis-Chalmers Mfg. Co. and much of the principal equipment was furnished by this company. Production on the 1,000,000-cu. yd. ballast order for the Atlantic Coast Line Railway began in March of 1927 and was completed in April of 1930. Work on the second contract for the same railroad was immediately begun and is now in progress. The plant's capacity is rated at 3,000 tons in 10 hr. A. W. Lumsden is general manager of the Trego company and H. C. Burgess is superintendent in charge of operations.

The design of this plant involved special considerations for the processing of hard granite, one of the toughest materials to quarry and process known in the industry. Three stages of crushing were resorted to and every materials-handling unit had to be designed to meet the hard usage characteristic to this class of work. The flow-sheet involves the principle of a straight-line flow, the stone progressing from stage to stage without recirculation. All buildings are of semi-fireproof construction, being covered with corrugated-iron sheeting.

A typical report from the Froehling & Robertson, Inc., laboratories at Richmond, Va., on the physical characteristics of the stone discloses the following:

Cylinder:		
Diameter	*in.*	2.017
Length	*in.*	2.000
Area	*sq. in.*	3.195
Breaking load	*lb.*	92,900
Unit load	*lb. per sq. in.*	29,104
Per cent. of wear (Deval)		2.3

TABULAR ANALYSIS OF OPERATIONS AND EQUIPMENT, TREGO STONE CORP., SKIPPERS, VA.
(Key numbers above 9 refer to corresponding equipment on the accompanying flow-sheet.)

Operation	Key	Equipment	Make	Size, Capacity or Type	Power Source	Power Transmission
Stripping	1	Steam-shovel	Bucyrus-Erie	B-2, ¾-cu. yd.		
	2	Cars (9)	Western	4-cu. yd. side-dump		
	3	Locomotives	Porter	16-ton steam saddle-tank		
	3	Locomotives	Vulcan	12-ton steam saddle-tank	15-h.p. G. E. motor ea.	
Drilling	4	Drill rigs (6)	Loomis Clipper			
		Drill rig	Cyclone			
	5	Secondary drills	Jackhamer S49			
			Gardner-Denver 11D			
	6	Air-compressor	Ingersoll-Rand	2-cyl., 10-in. by 14-in. and 14½-in. by 17-in.		
Loading	7	Excavator	Marion	No. 37, 1½-cu. yd.		
		Excavator	Bucyrus-Erie	No. 50-B, 2-cu. yd.		
Transportation	8	Quarry cars (6)	Koppel	9-cu. yd.		
	9	Locomotives (3)	Vulcan	10-ton	Gasoline engine	
	10	Inclined hoist	Allis-Chalmers	5-ft. single-drum	150-h.p. A.-C. motor	Direct
Primary Crushing	11	Crusher	Allis-Chalmers Superior	Jaw, 48-in. by 60-in.	200-h.p. A.-C. motor	Belt
	12	Conveyor No. 1	Stephens-Adamson	42-in., 114 ft. between centers, 250 ft. per min.	50-h.p. A.-C. motor	Texrope
Secondary Crushing	13	Crusher	Allis-Chalmers McCully	20-in.	150-h.p. A.-C. motor	Belt
	14	Conveyor No. 2	Stephens-Adamson	36-in., 155 ft. 9 in. between centers, 255 ft. per min.	50-h.p. A.-C. motor	
Scalping	15	Screen	Allis-Chalmers	72-in. by 12 ft., revolving.		
Tertiary Crushing	16	Crushers (2)	Allis-Chalmers McCully	10-in.	100-h.p. A.-C. motor	Belt
	17	Elevator	Allis-Chalmers	36-in. belt-bucket, 78 ft. between centers (9B)	125-h.p. A.-C. motor	Belt
Classifying	18	Screens (2)	Allis-Chalmers	60-in. by 24-ft., revolving	5-h.p. A.-C. motor	Direct
	19	Screens (2)	Niagara	4-ft. by 8-ft., 2-deck, vibrating	5-h.p. A.-C. motor	Direct
Storage	20	Storage bins (6)		75-ton		

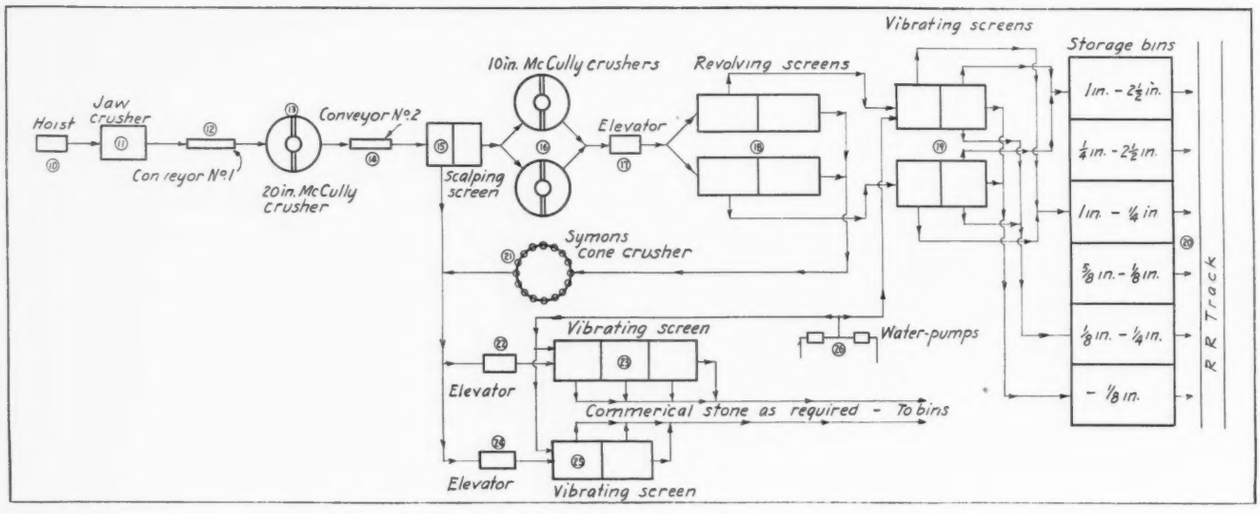
ADDITIONAL CIRCUITS FOR THE PRODUCTION OF COMMERCIAL STONE

Recrushing	21	Crusher	Symons	4-ft.	100-h.p. A.-C. motor	Texrope
	22	Elevator	Allis-Chalmers	No. 7½, 30-in., 66-ft. 6-in. between centers	25-h.p. A.-C. motor	Texrope
					20-h.p. A.-C. motor	
Classifying	23	Screen	Niagara	4-ft. by 8-ft., 4-deck, vibrating	7½-h.p. A.-C. motor	Texrope
	24	Elevator		24-in.	20-h.p. A.-C. motor	
	25	Screen	Niagara	3-ft. by 8-ft., 2-deck, vibrating	3-h.p. A.-C. motor	Texrope
	26	Pumps (2)	Allis-Chalmers		100-h.p. A.-C. motor	Direct

French coëfficient of wear..... 17.39
Hardness (Dorry) 19.37
Toughness:
Parallel to bedding plane..... 21
Perpendicular to bedding plane.... 25
Average 23

Some idea of the character of the rock obtained from the Trego quarry can be gained from the fact that seven blast-hole drill-rigs are required. As the deposit is a hard granite formation, the drilling is painfully slow, averaging 1 ft. or less per hr. To keep up with the 3,000-ton daily production, six Loomis Clipper and one Cyclone drill-rigs are kept in continuous operation. They are grouped together, resembling a number of oil-well derricks in miniature.

The quarry is approximately 1,700 ft. long and 375 ft. wide, and is nearly rectangular in shape. Operations are confined to the southern and western ledges; the eastern ledge with its overburden



Flow-sheet of operations, Trego Stone Corp. crushed-stone plant.

forms the bank of an adjoining creek. At present the ledge is 70 ft. high, on the average, above the quarry floor. A new cut into the floor 80 ft. deep will eventually place the loading operations 150 ft. below the ground level.

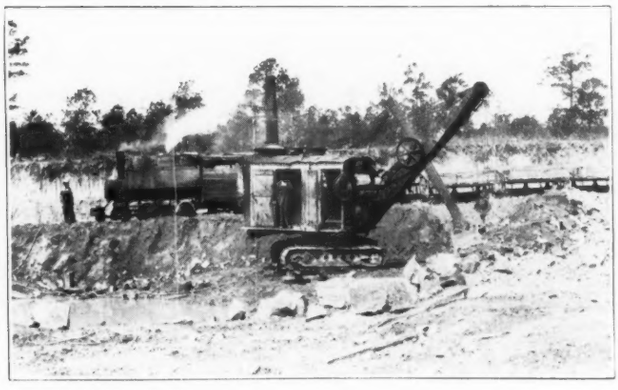
Blast holes are drilled 7 in. in diameter to a depth of 2 ft. below the quarry floor, on 15-ft. centers and usually 26 ft. back from the face. A typical charge per hole consists of 4 to 6 cases of Atlas 75-per cent. dynamite in the bottom and from 10 to 14 cases of Trojan 70-per cent. dynamite in the top. Cordeau-Bickford fuse is employed as the detonating agent. An average of more than 3 tons of rock per lb. of explosive has been maintained.

Two shovels are employed in the quarry for the loading of rock into the quarry cars. Through the use of two small shovels it has been found that all stone passing through their dippers is suitable for entry into the 48-in. by 60-in. jaw crusher. Thus, under the orders given the shovel operators, no stone greater in size than the dipper will pass is loaded—much to the advantage of the jaw crusher and its operators. The time lost in juggling a huge boulder into the crusher jaws is not offset by any gain in quarry output. Working together on a 10-hr. shift, the Marion 37 and the Bucyrus-Erie 50-B shovels have no difficulty in loading 3,000 tons of rock. Under pressure the Bucyrus-Erie shovel, a 2-cu.yd. unit, has handled as high as 1,000 tons of rock in 5 hr.

The quarry-to-plant transportation system consists of six 9-cu.yd. Koppel cars, three 10-ton Vul-

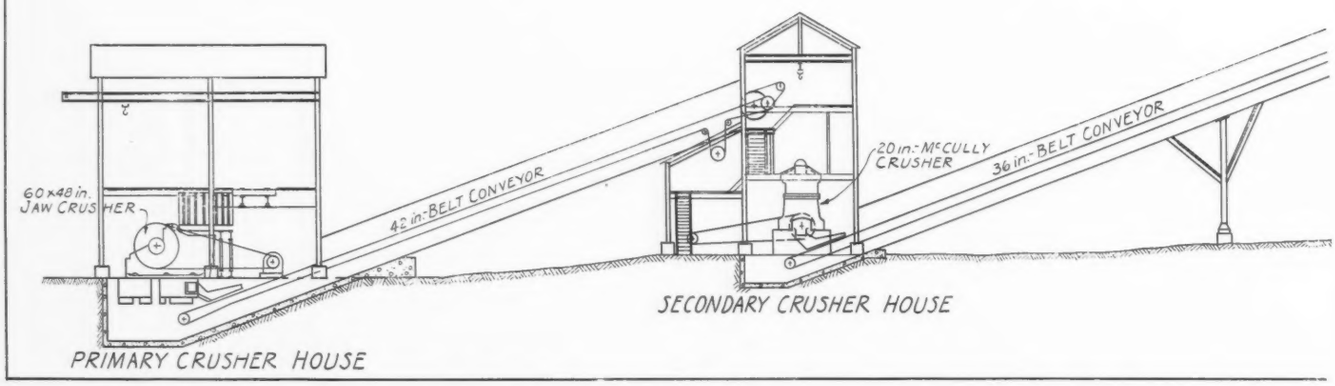
Loading blasted granite in the quarry.

A general view in the Trego quarry with the plant in the background.

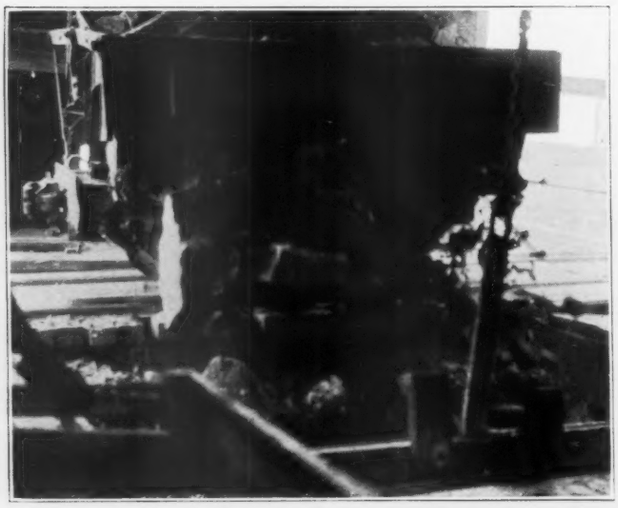


Shovel loading overburden to cars.

Elevations of crushing and screening operations at the Trego Stone Corp. plant.



can gasoline-engine locomotives, and a 17-deg. inclined hoist. A single track extends from the foot of the incline to the extreme corner of the quarry. Several spurs and branches of spurs provide servive to the various loading positions, in any one of



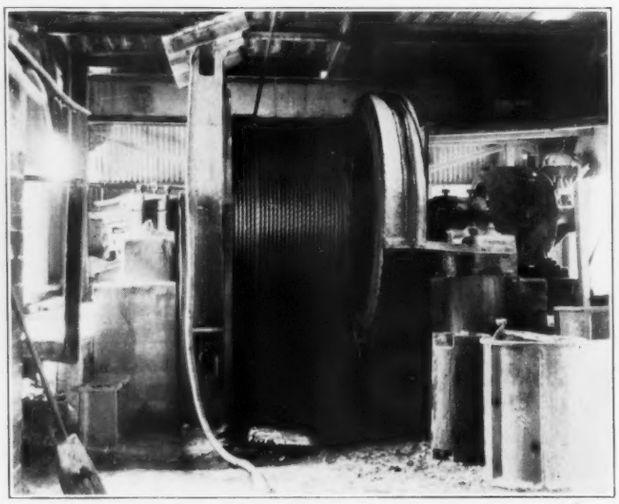
Car dumping a load of stone into the primary jaw-crusher.

which the shovel is served by two spurs, one for an empty quarry car and another for the car being loaded. Each of the three locomotives handles but one car at a time, hauling a loaded car to the incline and returning via the same spur with an empty car.

Cars are drawn up the incline to the primary-crusher-hopper platform by means of an Allis-Chalmers single-drum hoist. As the car approaches the hopper, an electric hoist is made ready to dump the car body under perfect control, preventing overcharging the crusher. The latter unit, also of Allis-Chalmers manufacture, reduces the hard granite boulders to a maximum size of 7 inches.

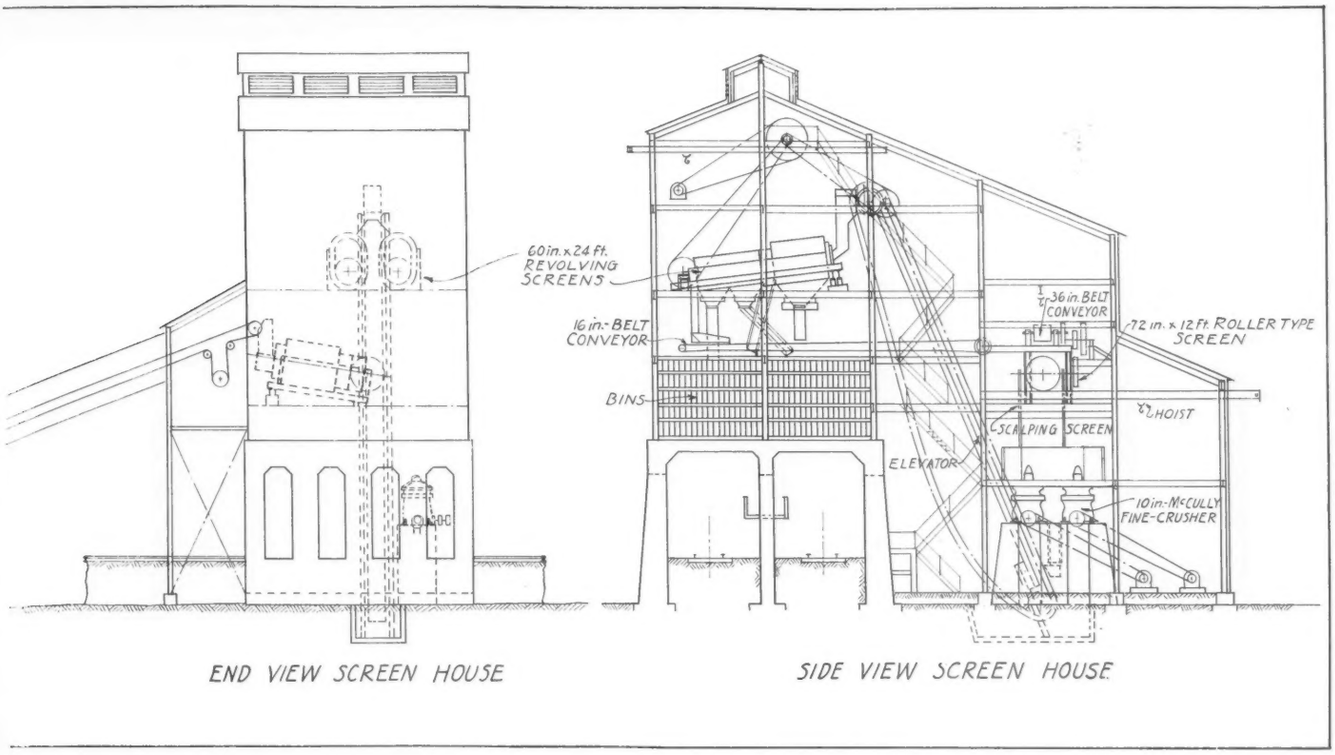
After primary crushing, the rock is conducted by conveyor No. 1 to the secondary-crusher building which houses the Allis-Chalmers 20-in. McCully crusher and its feed-hopper. This unit, almost always operating at its maximum capacity, reduces the rock to a maximum size of 4 in.

Following this operation the rock is transported by conveyor No. 2 to a revolving scalping-screen located in the top floor of the screening-and-loading building. This unit, with two sizes of screen open-



Hoist used for pulling cars up the 17-deg. incline to the plant.

ings, separates the rock into three sizes, sending minus-1-in. stone to either of the two commercial-stone elevator-and-screen circuits, minus-2½-in. stone direct to the revolving-screen elevator, and plus-2½-in. stone (rejected) to a feeder-bin supplying a pair of Allis-Chalmers 10-in. McCully crushers—the third stage of crushing. Crushed



stone, reduced to 2 in. or less by these units, is sent to the elevator, which delivers it to the classifying screens already mentioned. These units, with a pair of Niagara 4-ft. by 8-ft. washing-and-classifying vibrating screens, produce principally ballast materials. Minus-1-in.-stone is handled by the vibrating screens for the production of ½-in. to 1-in. stone and ⅛-in. to ¼-in. stone, while 1-in. to 2½-in. ballast stone is produced by the revolving screens. Plus-2½-in. stone is sent to the cone crusher for recrushing and subsequent classification into commercial-stone sizes.

The first commercial-stone circuit (flow-sheet operations 21 and 22) consists of a Symons 4-ft. cone crusher, an elevator, and a Niagara 4-deck washing-and-classifying screen. Any size stone from 1 in. to 2½ in. can be produced by it, as required. Material for this circuit is obtained from three sources: "throughs" from the scalping screen, "rejects" from the scalping screen, or "rejects" from the two revolving classifying screens.

The second commercial-stone circuit (flow-sheet operations 23 to 26) consists of an elevator and a Niagara 2-deck vibrating screen. This circuit produces 1-in. and 1¼-in. stone, receiving its material from the scalping screen.

Compressor house and tank which stores water for cooling.

Left to right: Supt. H. C. Burgess, C. W. Lucas, C. S. Lucas, L. J. Link, and W. F. Jones.

In the bin structure provisions are made for the storing and loading of six sizes of materials in 6 compartments, each of which has a capacity of 75 tons. Truck facilities extend beneath the bins, and cars are loaded from bin-gates above and move by gravity.

The plant before it was inclosed.

After the plant was completed.

Member Concerns Supply Aggregates for Producing Pre-Mixed Concrete

Fourteen Waterbury, Conn., Dealers and Contractors Are Joint Owners of Plant

By HARRY E. HOPKINS

FOURTEEN local representative building materials dealers and contractors, in order to serve their allied interests, decided in the winter of 1930 to build and operate a pre-mixed-concrete plant in Waterbury, Conn. A company was organized and incorporated as the Waterbury Ready-Mixed Concrete Co.

Naturally, as the most suitable place for a pre-mixed concrete plant was in the heart of the building-supplies district, its location was fixed in the yard of the building-materials company, Chatfield & Chatfield, Inc., a company member, at 94 Benedict St. The executive offices are in the Chatfield Bldg., opening on the street line for the convenience of customer service. This plant site also allows the use of a spur track from the main line of the New York, New Haven & Hartford Railroad for receiving raw materials in bulk. This site also provides ample room for accommodating its trucks.

Construction was begun immediately, and on April 1 of this year the plant was put in operation.

Unlike those pre-mixed-concrete plants which prepare the concrete at the plant in its entirety, the Waterbury company does not encounter such problems as aggregate segregation in hauling, the installation of a water-supply system, etc. Mixing and watering are part of the truck-mixer's work, therefore the concrete is prepared on the way to the job and received ready to pour into the forms. This method allows the company to make hauls to points as far as 30 mi. from the plant.

The sand and crushed stone are supplied by company members who operate pits and quarries within a radius of some 12 mi. from Waterbury. These materials are either delivered at the spur track or trucked direct from the pits and quarries.

An Erie AggreMeter plant with nine compartments is provided for the sand, stone and cement storage. Six of the compartments, each with a capacity of 35 cu. yd., are arranged for the storage of the sand and stone.

The materials are conveyed to the plant by trucks or railroad cars and are discharged into hoppers equipped with undercut gates, which in turn discharge to the belt-feeder. The materials are then conveyed to the top of the storage plant (about 60 ft. high) by means of a Link-Belt elevator powered by a Westinghouse 10-hp. motor.

The elevator discharge-spout is of the bifurcated type controlled from the operator's platform, and any one of the six compartments of the aggregate bin can be easily loaded. An indicator shows the exact location of this spout.

The three remaining compartments of the bin are used for the storage of cement and have a ca-

pacity of 450 bbl. each. They are of weather-tight construction and are loaded by means of a Fuller-Kinyon system, consisting of a type A 3-in. portable unloading pump with a capacity of 80 bbl. per hr., so arranged that any of the three bin compartments can be loaded by operating a 3-way valve inserted in the pipe-line. Unloading can be accomplished from either railroad cars or trucks. This is possible by using a special system of piping with a swivel joint.

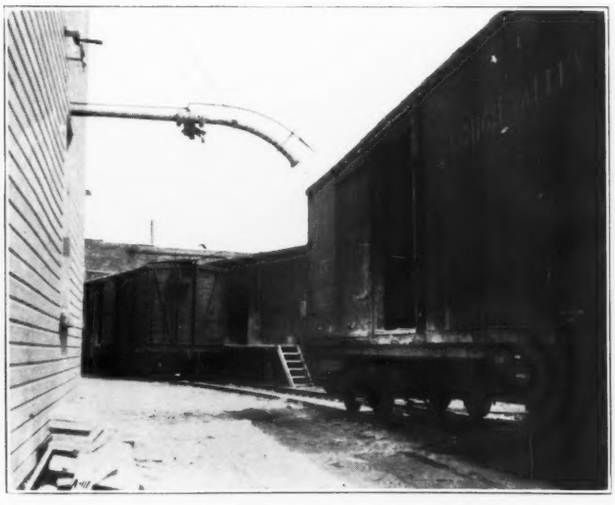
An air-compressor unit for supplying the necessary air was also furnished by the Fuller Co. Clean air is assured by the use of an American air-filter.

All three cement compartments are arranged for discharging through Fuller-Kinyon valves into a single Erie CemMeter, equipped with a 3,000-lb. charging-type Buffalo scale with an indicator dial. The charging gates of the CemMeter are controlled by levers arranged for centralized operation. Discharge is controlled by means of a hand-wheel-operated vertical gate of the rack-and-pinion type discharging directly into the truck-mixer charging hopper.

The six compartments containing the aggregates are arranged to discharge through six clam-shell gates into a single 3-cu. yd. Erie Weighing AggreMeter, which is equipped with a 17,000-lb., 3-beam scale of the charging type (also manufactured by the Buffalo Scale Co.) and an auxiliary dial which shows only the approach to the desired weight. The AggreMeter has a single clam-shell discharge-gate which controls the flow of material into the truck-mixer charging hopper along with the cement. All levers of the charging and discharging gates are centralized so as to be directly in front of the scale and close to the levers which are used for the operation of the CemMeter.

With this unit a batch of cement, sand and stone can be loaded, accurately weighed, and discharged in less than 1 min. Several jobs with different mixes can easily be supplied without retarding operation in any way.

Standard Portland cement is used almost entirely at this plant, although, when so specified, the Magnolia brand of puzzolan cement is employed for sidewalks, base courses, pavement and similar work requiring a stainless surface.



Pipe for pneumatic unloading of bulk cement from box-cars.

The Waterbury company operates 4 truck-mixers: 2 Rex 3-cu. yd. machines and 2 Jaeger machines, one being a 3-cu. yd. unit and the other a 2-cu. yd. unit. According to specifications, the mix proportions are: 1:1½:3, 1:2:3, 1:1¾:3½, 1:2:4, and 1:2½:5.

"In the few months during which we have been operating," said A. J. Sardinsky, the plant superintendent, "we are highly gratified with the results we have obtained from our Mack and International trucks. In transporting 10 tons or more over the territory here in Connecticut—rough in places and steep in grade—great care must be exercised if we are to get economical operation and service from our trucks, and we do. Furthermore, our trucks can haul and mix concrete with sufficient speed to keep the largest jobs supplied without loss of the workers' time."

Mixing truck beneath hopper ready to be loaded with materials.

Business conditions in and around Waterbury are about as elsewhere on the Eastern coast. Orders are coming in slowly and intermittently. "At the same time," declared Joseph DeLauretis, manager of the company, "I feel that we have acted wisely in going slowly in the development of our four-months-old plant. Suppose we had used snap judgment in overbuying our equipment and trucks, where would we be to-day? As it is now, we are doing a fair business. Our plant was designed to allow enlargement when business requires it, and we are sufficiently optimistic to believe that business will increase after a while, particularly as our company members are in a position to help the Waterbury company to succeed by the orders that come to us from them collectively."

The company has already completed some good-sized construction jobs in and around Waterbury, and is looking forward to getting additional building and highway orders in the early autumn.

The officers of the company are: J. Francis Smith, president; Joseph S. Barbara, vice-president; Benjamin Chatfield, treasurer; Harold M. Brown, secretary; and Joseph De Lauretis, manager. A. J. Sardinsky is superintendent.

The Solid-Carbon-Dioxide Question as a Practical Lime Man Sees It

By E. H. McEUEN

A NUMBER of voices have been heard during the last year or two both for and against the possibilities of solid-carbon-dioxide manufacture as a by-product from lime kilns. Various news agencies have looked upon the subject as a sort of a "man bite the dog" idea and echoes of the unusual possibilities of solid carbon dioxide have been heard from all points of the compass. Notwithstanding some rather pointed opinions to the contrary, both expressed and unexpressed, in this fair land of ours, the lime industry as a whole has within it some successful business men who are endowed with the proper measure of progressiveness and, as executives, refuse to be stampeded into untried fields unless and until sufficient facts have been brought forward to remove the experimental and speculative features of the venture at hand.

Perhaps the one great trouble to-day with the carbon-dioxide problem as it applies to lime kilns is the fact that most of the information to date has come principally from the side lines and the one seeking to form some comprehensive idea of the possibilities of its recovery as a profitable by-product from his plant must pick carefully through the mass of opinions offered and select those properly fitting his own particular case. The recent article in PIT & QUARRY by C. L. Jones was very interesting and the subject is covered in a manner which would indicate the long study and application given the subject by the author. And yet it is obvious that Mr. Jones writes strictly from the viewpoint of the Dry Ice Corp. of America. This viewpoint as presented is in order and appreciated, no doubt, by all who read it but the fact remains that to make a direct application of the facts set forth to any single lime plant it is necessary to choose and discard until a proper selection of facts is made to fit the problem at hand.

The Dry Ice Corp. of America is not interested in the production problems of the lime industry. It is much concerned about the national development of a market for solidified carbon dioxide or "dry ice" and the proper protection of any of the copyrights and patents which it may hold in connection with the business. No lime manufacturer will take any exception to its rights in this respect, but the fact remains that its viewpoints regarding carbon-dioxide recovery from lime kilns may not always run parallel with the views of the progressive lime manufacturer.

E. H. McEUEN

The author of this article has had a wide and diversified career in the lime industry. At present he is operating his own plant in California. He is an engineer who has made a specialty of the design, erection and operation of lime-producing units. He has made the study of CO_2 recovery from lime kilns his forte in recent years and was the author of the chapter dealing with the recovery of this by-product in the 1930 PIT AND QUARRY HANDBOOK.

Engineers familiar with the subject are agreed that the production of solid carbon dioxide from kiln waste gas is not a panacea for the ills of the industry or an idea that can be applied successfully in blanket form to every lime plant in the country. Far from it. The revolutionary nature of the product as a refrigerant, with its lack of adaptability to the various types of refrigerating equipment now in use, acts as a deterrent in the rapid acceptance of "dry ice" as a universally used commodity. The high cost of pioneering sales, introducing new methods, competing with the convenience and satisfaction of the present methods of domestic and commercial refrigeration must be taken into consideration along with the cost of reclaiming the waste gas before it can be safe for the idea to be applied to any lime plant.

But with all these seemingly conclusive facts before us it can not be laid down as a hard and fast rule that there are no lime plants in the United States where the recovery of carbon-dioxide gas can not be accomplished with a profit. Every lime executive must know his plant as well as his market territory and all the potential outlets for any sort of product he may desire to manufacture. Thus it becomes entirely a local problem. This is true with any by-product from the lime plant. Many plants have not found it profitable to produce crushed rock. Many different standards of lime products are set up entirely in accordance with local demand. There are still a few plants that do not make hydrated lime and it is reported that a few still pack quicklime in wood barrels only with no bulk shipments other than local sales. All these activities are based on local conditions. It follows that there may be some localities where it is highly feasible and practical to produce solid carbon dioxide from lime kilns and make it a profitable enterprise. And with the same breath the writer admits there no doubt are many plants where it would be rank folly to undertake it.

All which, summed up, means that this matter, like many others, will be solved by the individual for himself with the help of various sources of dependable information applying to his own market territory. Many who read this will recall a number of experiences during the past ten years where standards have been set up from apparently reliable sources and offered as the universal way out of certain operating problems peculiar to the lime industry, with the result that, upon ap-

plication, there were found to be exceptions to the rule and every individual plant owner would be forced to shape the rule more or less to fit his particular needs.

In so far as the writer knows, there is not a single lime plant in this country at the present time where carbon dioxide is being reclaimed as a by-product, but it is his opinion that before many years it will be done profitably and we shall see the market developed for this product to the point where its production is no longer so speculative as it is now. Like all new ideas this one must be approached with caution and there is little doubt that the men who have been responsible for the progress made in lime manufacture during the past decade will be found on the job as usual, not ready to be stampeded into the premature development of an untried or unproved idea or found far behind when the moment arrives that solid carbon dioxide can be produced at their plant, in a profitable manner.

Mica Production Increases in 1930 But Value Declines

The total quantity of uncut mica sold by producers in the United States in 1930 was 7,465 short tons, valued at $286,407, as reported by the United States Bureau of Mines. These figures (including sheet and scrap mica) represent an increase in quantity of 2.7 per cent., and a decrease of 29.1 per cent. in value, as compared with 1929. The decline in total value is due partly to the inclusion in 1930 of a larger proportion of scrap mica in the total sales than in 1929. Of the total quantity sold, 733 tons (1,465,485 lb.), valued at $177,307, was sheet mica, including 1,253,782 lb. of punch mica, valued at $61,230, and 211,703 lb. of mica larger than punch, valued at $116,077. A very small quantity of uncut domestic splittings was reported by one producer and included in the sales of sheet mica. In addition to sales of sheet mica, there were 6,732 tons of scrap mica sold in 1930, valued at $109,100.

The sales were made by eleven states: Alabama, Colorado, Connecticut, Georgia, Maine, New Hampshire, New Mexico, North Carolina, South Carolina, South Dakota, and Virginia.

NO depression at the Skippers, Va. plant of the Trego Stone Corp. This concern, after filling a contract for 1,000,000 cu. yd. of ballast, is now working on another order for 800,000 cu. yd. Operating methods at this plant are described in an article beginning on page 55.

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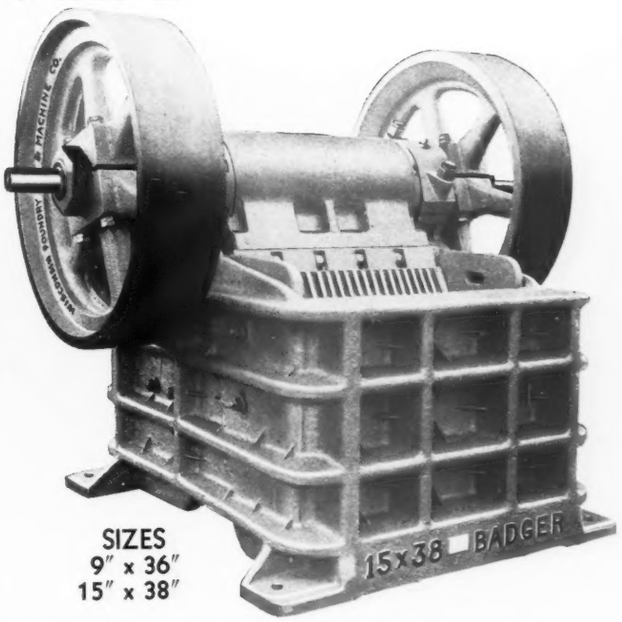

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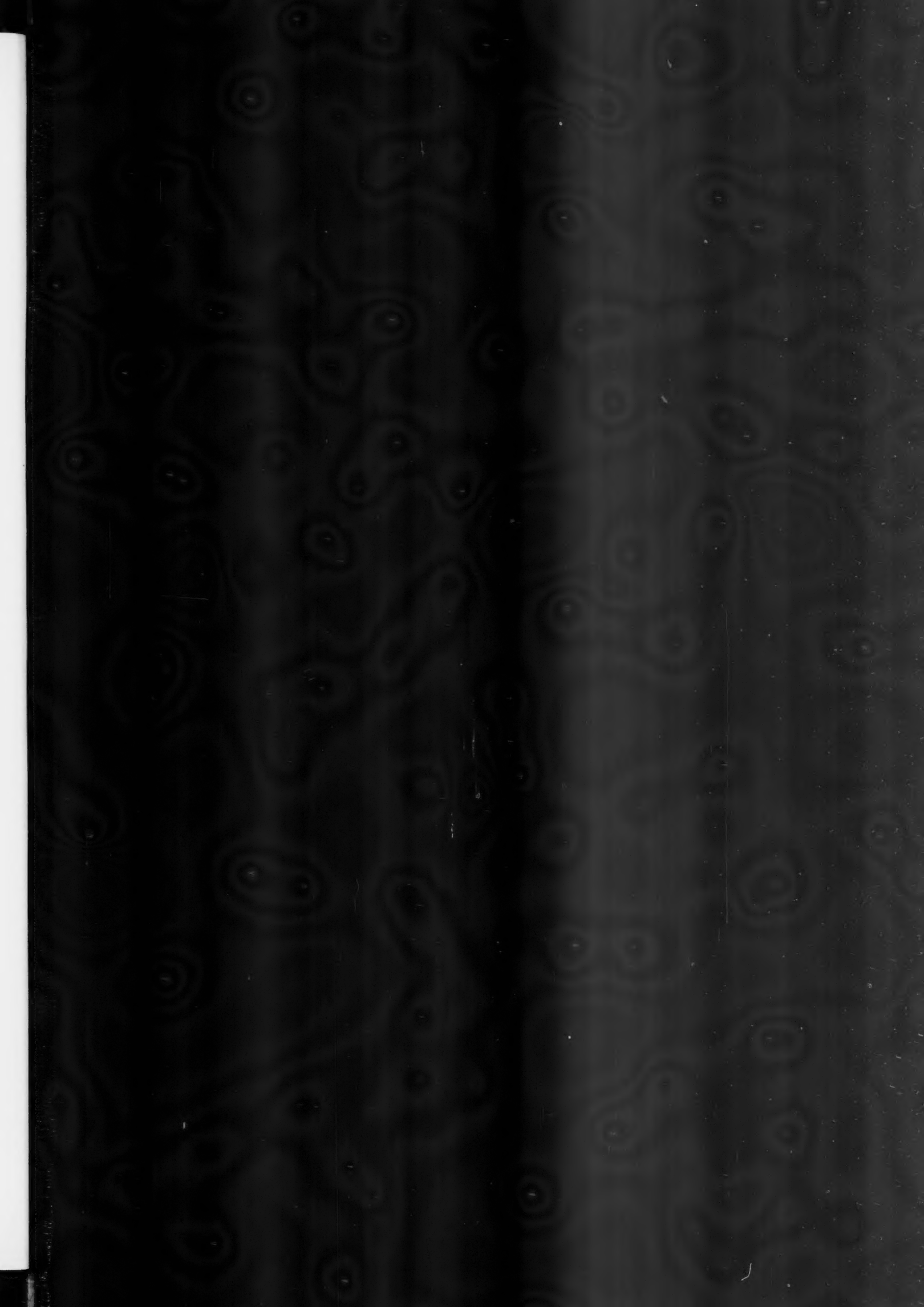


Can Waste Heat from Kilns Be Employed to Improve Portland Cement?

By AMAN MOORE
President, Cement Securities Co., Ltd.

The question which the author asks is an important one and the answer he offers is certain to provoke controversy. Opinions on both sides of the subject will be welcome and will be published.

HAVING been in the cement business since 1887, before the rotary kiln had come into general use, I remember the fuel economy obtained in the old Dietz upright kilns, to-wit: the consumption of 55 lb. of West Virginia slack coal for the burning of one barrel of cement clinker as against the consumption of 81 lb. of slack coal for the burning of a barrel of clinker in the longest rotary kiln (400-ft.) now operated. Other rotary kilns, ranging down to 125 ft. in length, consume from 81 lb. to 140 lb. of pulverized coal per barrel of clinker burned. In the past it has seemed logical to install waste-heat boilers, since the old plants had short kilns with stack temperatures ranging from 1,200 deg. to 1,800 deg. F. So long as the quality of cement obtained from the clinker burned would pass the "standard specifications," no further thought was given to the production of a superior quality or high-early-strength cement.

The first modern 150-ft. kilns were placed in the plant of the Union Portland Cement Co. at Devil's Slide, Utah, in the year 1906. Before that Edison had installed two 150-ft. kilns at New Village, N. J., but they were made in 12-ft. cast-iron sections with flanged cast-iron plates bolted together. There were separate riding rings and supports at 12-ft. intervals along the length of the kilns. The 150-ft. modern kilns at the Devil's Slide plant were built by the Allis-Chalmers Mfg. Co. and are still operating. In the following year, 1907, 150-ft. kilns were installed at the plant of the Southwestern Portland Cement Co. at El Paso, Tex. The first kiln longer than 150-ft. was installed at the plant of the Oregon Portland Cement Co. at Oswego, Ore., in 1910 and 1911. This kiln was 210 ft. in length and was the first one with a "soaking-zone" section in front installed in America. It was 9 ft. in diameter for the first 10 ft. of its length at the clinker-discharge end, and then had a 60-ft. "soaking zone" 10 ft. in diameter offset to 9 ft. for the remainder of the length of the kiln.

In view of past experience and the results obtained from the operation of kilns up to 400 ft. in length, it would seem that there should be no hesitancy in further increasing the lengths of rotary cement kilns to at least 600 ft. It is therefore planned to install kilns 11 ft. 3 in. in diameter for a section at the discharge end of the kiln, 15 ft. in diameter for a distance of 60 ft., and then tapering back to 11 ft. 3 in. in diameter for a few feet or a sufficient length for a riding ring to support the kiln. It will once more be enlarged to 15 ft. for a second soaking zone 15 ft. in diameter for a distance of 60 ft. and then taper back to 11 ft. 3 in. for the remainder of the 600-ft. total length.

The object of the two soaking zones is twofold. First, the lower clinkering zone will hold back the material in the white-hot clinkering zone for an extra length of time so as to allow a more complete chemical action to take place, thereby increasing the tricalcium silicate and tricalcium aluminate and calcium-ferro-aluminate, which I claim are the three compounds in Portland cement that give early strength. All other compounds, including the dicalciums, to me are incomplete chemical compounds and give very little, if any, strength. They harden slowly and, hence, are undesirable in cement. The second soaking zone farther back in the kiln is for the purpose of holding the material back for a sufficient length of time completely to drive off the CO_2 before the material passes over the smaller section of the kiln and into the lower, or clinkering, soaking zone. Soaking zones placed far back in the kiln have been used in some plants for the purpose of holding the material back until the CO_2 has been driven off, and other soaking zones, like the one in the kiln at the Oswego, Ore., plant, are placed lower down in the clinkering zone. Both soaking zones have been proved to be an improvement and a success. Therefore, the two soaking zones in one kiln should prove to be successful.

The temperatures of the gases at the back end of the kiln are almost in direct ratio to the length of the kiln. The old 6-ft. by 60-ft. kilns gave off stack temperatures around 1,800 deg. to 2,000 deg. F. Kilns 125 ft. long give off gas with a temperature around 1,500 deg. to 1,800 deg. F.; kilns 150 ft. long give stack temperatures from 1,200 deg. to 1,500 deg. F.; 200-ft. kilns show stack temperatures ranging from 1,000 deg. to 1,200 deg. F.; 400-ft. kilns give off gas with a stack temperature ranging from 900 deg. to 1,200 deg. F. It is my opinion that 600-ft. kilns will reduce the stack temperature to or near 500 deg. F.

The reasons why I am opposed to the installation of waste-heat boilers are several. The waste heat should be utilized in the kilns themselves by extending their length. By lengthening the kilns and so utilizing the waste heat, no obstacles are placed in the way of the natural draft in the kiln, and, in my opinion, the kiln will produce a greater output of a better-burned clinker by having no such obstacles in it. It is not proper to fill up the back end of the kiln with chains, cross plates and other

devices to utilize the waste heat, as all such installations obstruct and interfere with the natural draft through the kiln. The only benefit that chains might have would be to break up mud rings, in the event that they should form in the long kilns at the lower temperature at the back end. But, operating with vacuum-filter presses, whereby the percentage of water in the raw mix is reduced to approximately 18 per cent., no mud rings should be formed. If they should form, however, and become a hindrance in the operation of the kilns by obstructing the draft, then, if chains are added at all, they should be no more than needed to break such rings.

In operating kilns under such conditions the consumption in fuel will be brought down very close to that of the old Dietz upright kilns. In other words, the greatest economy obtained in the longest kilns operating—400 ft. in length—is equivalent to 81 lb. of coal as against 55 lb. of coal in the old upright Dietz kilns. Therefore, there is still a waste of 26 lb. of coal per barrel of clinker burned in the operation of the 400-ft. kilns. By increasing the kiln to 600 ft. in length the temperature can be brought down to near 500 deg. F. and the consumption of fuel will approximate that of the old upright Dietz kiln. In my opinion, however, it would still require additional length above the 600 ft. in order to secure the maximum economy in fuel consumption. Whether that length will be 800 ft. or more I can not say. It remains for future practice to determine the fact.

There is one other great advantage obtained by installing the long kilns which will probably prove to be the greatest improvement, next to the quality of cement itself, that has ever been made in the cement industry, namely the recovery of the CO_2 and the manufacture of that into gas-ice, which is a new product that is just coming into its own and that may gradually replace water-ice for general use.

By lengthening the kilns economy in fuel consumption can be obtained, and a more perfect cement clinker can be burned, decreasing to the minimum the dicalciums and increasing to the maximum the tricalcium aluminate, the tricalcium silicate and the calcium-ferro-aluminate. A perfect-quality cement could be produced, one which would be a quick-hardening Portland cement, and the temperature of the stack gases would be reduced to such a low point that the expense of cooling them further to make possible a cheap recovery of the CO_2 and converting it into a solid gas-ice would be as low as, or lower than, that of any other method.

One other objection to the installation of waste-heat boilers is that it makes it impossible ever to lengthen the kilns, although that must finally be done in order to produce a true quick-hardening Portland cement in one burning. Furthermore, when power can be purchased on the market at a cost of 1c. or less per kw. hr. it will not pay to operate waste-heat boilers. Here in Southern California we can purchase power at approximately 0.72c., and in many other places in the United States one can purchase power at less than 1c. The initial expense of installing waste-heat boilers due to the fact that much greater boiler area is required for producing steam from waste kiln gases, and the depreciation caused by the elements in the gas, such as dust, sulphur, etc., prevent the most economical operation of the boiler equipment. Therefore, wherever power can be purchased at a cost of less than 1c., no consideration should be given to the installation of waste-heat boilers even for comparatively short kilns. This latter argument would apply even though my main contention—that consuming the waste heat by lengthening the kilns themselves is the proper and economical method of securing economy in the utilization of waste heat from the kilns—is incorrect.

Waste-heat boilers are absolutely improper if quick-hardening Portland cement is to be manufactured economically. If the kilns are sufficiently short so as to secure gas temperatures high enough to generate steam from the waste heat, then the kilns will be too short to manufacture quick-hardening Portland cement with only one burning. If short kilns and waste-heat boilers are to be used, the result will be ordinary Portland cement. In making quick-hardening Portland cement it will be necessary to use long kilns with "soaking zones" in order to hold the material back in the kiln sufficiently long to allow a complete or perfect chemical action to take place and produce the maximum amount of tricalciums and thereby replace the dicalciums.

Quick-hardening Portland cement should really be called perfect Portland cement. The quick-hardening character of the cement becomes the inevitable result when the clinker is produced under conditions which enable one to add to the raw mix the full theoretical amount of lime that is required to produce all tricalcium silicate plus tricalcium aluminate plus calcium-ferro-aluminate, the three compounds which mainly give all the strength to cement. In other words, all the dicalciums are eliminated by conversion into tri-calciums when the kilns are made long enough and "soaking zones" are provided so as to hold back the clinker during the process of fusion in the white-hot zone a sufficient length of time to allow complete and perfect chemical action to take place. When the kilns are made sufficiently long to consume the waste heat in the kilns themselves and when it is necessary to have the long kilns in order to produce a high-early-strength cement with one burning only, then there is no waste heat left for producing steam in waste-heat boilers and waste-heat boilers become unnecessary.

Another article by Aman Moore is scheduled to appear in a forthcoming issue. The next will deal with the production and future market for quick-hardening Portland cement.

MEN OF THE INDUSTRY

The portrait printed on this page in each number of PIT AND QUARRY is selected without significance as to current events or the position of the individual in the industry.

JACK DEMPSTER

Canada Cement Co., Ltd.
Port Colborne, Ont., Can.

Coming Events

Oct. 8, 1931. St. Louis, Mo. Monthly meeting, St. Louis Quarrymen's Assn., Forest Park Hotel. E. J. McMahon, exec. sec., 4063 Forest Park Blvd., St. Louis, Mo.

October 12-16, 1931. Chicago, Ill. National Safety Congress. W. H. Cameron, secretary, National Safety Council, 20 N. Wacker Drive, Chicago, Ill.

Oct. 19-23, 1931. Pittsburgh, Pa. Thirty-seventh annual convention, American Society of Municipal Engineers, William Penn Hotel, Geo. M. Lehman, secretary, 420 City-County Bldg., Pittsburgh, Pa.

Jan. 9-15, 1932. Detroit, Mich. Annual Convention and show, American Road Builders Assn. Chas. M. Upham, engineer-director, National Press Bldg., Washington, D. C.

Jan. 19-22, 1931. Pittsburgh, Pa. Annual Convention, National Crushed Stone Assn., Wm. Penn Hotel. J. R. Boyd, secretary, Merchandise Bldg., Washington, D. C.

Jan. 25-26, 1932. Pittsburgh, Pa. Annual convention, National Ready-Mixed Concrete Assn., Wm. Penn Hotel. V. P. Ahearn, executive secretary, Munsey Bldg., Washington, D. C.

Jan. 27-29, 1932. Pittsburgh, Pa. Annual convention, National Sand & Gravel Assn., Wm. Penn Hotel. V. P. Ahearn, secretary, Munsey Bldg., Washington, D. C.

Feb. 3-4, 1932. Washington, D. C. Annual meeting, Sand-Lime Brick Assn. Ellen Knight, sec., 321 N. Hamilton St., Saginaw, Mich.

Feb. 23-26, 1932, Wichita, Kan. Seventh Annual Southwest Road Show and School.

Feb. 23-26, 1932. Washington, D. C. Annual convention, American Concrete Institute, Wardman Park Hotel. Harvey Whipple, sec., 2970 West Grand Blvd., Detroit, Mich.

Pumpings from the Old Pit

Excerpts from the old files of PIT AND QUARRY *reveal many interesting sidelights on the activities of the pits, quarries and plants of former days. These are printed in this column each issue.*

Fifteen Years Ago

THE Snyder Sand & Gravel Co. of Rock Island, Ill., was awarded $910 damages following a crash between one of its gravel barges and a pier of the bridge over the Mississippi River at Fulton, Ill. It was contended that the pier was not protected by a sheer boom as required by law.

* * *

What appeared to be the tusk of an extinct North American elephant or some other prehistoric animal was unearthed while excavating in the pit of the Ideal Sand & Gravel Co. at Mason City, Ia.

* * *

Ten Years Ago

ANNOUNCEMENT was made of the formation, at Los Angeles, of the California Gypsum Corp. with an authorized capitalization of $3,000,000. The foundation of the enterprise was the ownership of 1,200 acres in Imperial County, 600 of which were said to be rich in gypsum deposits.

* * *

The Gilboa Trap Rock Co. opened its new plant and quarry at Lambertsville, N. J. Capacity was 240 tons per hour. Officers were: R. A. Montgomery, president; Richard Montgomery, vice-president; and Louis Tooks, superintendent.

Reorganization of the Signal Mountain Portland Cement Co. of Chattanooga, Tenn., resulted in the election of John L. Senior as president. Mr. Senior at that time was also president of the Peninsula Portland Cement Co. at Cement City, Mich., and a director in the Trinity Portland Cement Co. of Dallas, Tex.

* * *

The Interlachen Sand & Gravel Co. was formed at Interlachen, Fla., with a capital of $30,000. George E. Welch was president and J. H. Wylie, secretary.

* * *

Five Years Ago

THE Vulcan Rock Co. of Hoyt, Cal., was purchased by the Pratt Rock & Gravel Co. of Sacramento. The acquisition of the Vulcan company and its plant gave the Pratt organization five plants in the vicinity of Sacramento.

* * *

Greater economies of operation followed the opening of a new crushed-stone plant at Hillsville, Pa., by the Lake Erie Limestone Co. of Pittsburgh. Most of the product was used for fluxing purposes at the Pittsburgh steel mills. The company also operated the Newcastle Lime & Stone Co. and the Union Lime Co. as subsidiaries.

Appoints Representative for Omaha, Neb., District

The Gardner-Denver Co. has completed arrangements with the Interstate Machinery & Supply Co., of Omaha, Neb., whereby the latter has an agency in Omaha and vicinity for Gardner-Denver products.

Included in the products distributed by the Interstate Machinery & Supply Co. are Gardner-Denver horizontals and vertical compressors; steam and power pumps; portable compressors; rock drills and accessories.

These arrangements make available to the trade in the Omaha territory a more convenient source of supply of Gardner-Denver products.

Adds Modern Equipment to Produce Paper Bags

The Universal Paper Bag Co., established in 1888 and having offices and factory at New Hope, Pa., has recently equipped its plant with the most modern and up-to-date bag-making machinery available.

This new plant is now manufacturing high-quality kraft multi-wall paper bags for the cement and pulverized-rock industries.

The Universal Paper Bag Co. also announces the appointment of E. T. Statler to the multi-wall paper-bag sales division. Mr. Statler has been identified with the multi-wall paper-bag industry since its inception.

UNEMPLOYMENT

"AM I MY BROTHER'S KEEPER?"

To Dole or not to Dole, that is the question. Why fiddle while the country burns? Let's be UP AND DOING! LEND A HAND!

A victim of an accident finds many willing hands. Is not involuntary unemployment an accident? Why not an endless chain suggestion passed on to the more happily circumstanced, that they succor the helpless victims of this unhappy economic situation? Why pass the "Buck" to George or squabble about methods? The victim is "confronted with a condition and not a theory." We should not rape charity in the use of coercion or pressure by the whip of authority. Charity or good will without free will is no benevolence at all. Remember the circumstances of some in employment may be worse than those of many more provident people out of employment.

If you like the idea, resolve to do your bit and become a link in a chain that with a slight effort on your part may open the flood gates of mercy where you least expect. In all cases, let each man's conscience be his guide.

We have submitted the above statement to each one of our employees without comment for such independent action as they may determine best for themselves and in accordance with their own inviolate right as they understand the right.

"If winter comes, can spring be far behind?"

Illinois Powder Manufacturing Co.
ST. LOUIS, MISSOURI

The above appeal to aid those who are unemployed was distributed by the Illinois Powder Manufacturing Co. to its employees.

Personal Mention

Victor Deifenderfer, plant superintendent of the Superior, O., cement plant of the Wellston Iron Furnace Co., has resigned and has taken up residence with his family at Sciotoville, O. **Robert Callihan,** who resigned several weeks ago as superintendent of the Wifco mortar department of the Superior plant, has accepted a position with the Gulf Gasoline Co., at Pittsburgh. **Clyde Turley** of Ironton, O., has been employed as storekeeper at the Superior cement plant.

H. W. Chutter of Fresno was elected president of the California Association of Concrete Pipe Manufacturers at the annual convention held last month at Fresno, Cal. He succeeds **Fred Spiekerman** of Lodi. **B. R. Pollard,** also of Fresno, was named vice president and **A. A. Clark** of Visalia was re-elected secretary-treasurer. Directors include the three officers and **H. A. Weigand,** San Jose; **Walter Lenz,** St. Helena; **T. M. Porter,** Lindsay; **Gilbert Williamson,** Yuba City; **J. J. Duggan,** Porterville, and **B. J. Ykropina,** Los Angeles.

W. P. Stoker of Kansas City, Kan., has leased the asphalt quarries near Pleasanton, Kan., and is planning to operate as soon as arrangements can be completed and crushing equipment installed.

Roscoe Seybold has been named comptroller of the Westinghouse Electric & Manufacturing Co., being advanced to the position from the post of assistant to the president. He has been continuously in the service of the Westinghouse company for 24 years. A native of Rockville, Ind., and a graduate of Purdue University, he joined the Westinghouse organization in 1907.

J. O. Ferch has been appointed advertising manager of the Harnischfeger Corp., Milwaukee, Wis. **H. S. Strouse,** former advertising manager, has been elected treasurer.

Allan S. Ullathorne has been appointed treasurer of the Hollywood Concrete Pipe Co., with plants at Memphis and Alexandria, La.

Charles P. Mills, recently director of the chrome-alloy department of the General Alloy Co., has resigned to take the position as chief engineer of Empire Steel Castings, Inc., Reading, Pa. Mr. Mills is one of the leading authorities on heat and corrosion-resisting chrome-iron and chrome-nickel castings and was for many years chief engineer of the Duraloy Co. of Pittsburgh. He is a graduate of the engineering department of the University of Pennsylvania, and spent four years at the Panama Canal, after which he was associated with the Fort Pitt Bridge Co. of Pittsburgh as designing and sales engineer. He first became interested in alloys in 1921 and has actively followed this line to the present time.

Chas. P. Mills.

F. D. Hooper, formerly sales manager of the Lidgerwood Manufacturing Co., of Elizabeth, New Jersey, has become a member of the Barber-Greene Co., Aurora, Ill., in which he will act in the same capacity. Mr. Hooper was born and raised on the "sidewalks of New York." He received his mechanical-engineering and electrical-engineering degree at Sibley College, Cornell University, graduating in the class of 1907. He was employed by the Lackawanna Steel (now Bethlehem Steel) and the Boston & Maine Railroad before starting his twenty-four years of continuous service with the Lidgerwood Manufacturing Co.

F. D. Hooper.

Jack Conway has been named sales manager of the H. O. Penn Machinery Co., distributors for the Butler Bin Co., and The Byers Machine Co., at 140th St. and E. River, New York, N. Y. Mr. Conway, in the construction-equipment field, has acted as sales manager for the Complete Machinery Co., of New York, Hunter Machinery Co., of Pittsburgh, and the Leach Mixer Co.

Joseph B. McCracken has been appointed sales manager by the Keystone Portland Cement Company, Philadelphia, Pa. Mr. McCracken was formerly connected with the Atlas Portland Cement Co. in New York and Chicago before it was absorbed by the Universal company.

W. H. Brooks of Wisconsin Rapids, Wis., has been appointed sales manager for the state of Minnesota by the Delano Granite Co. of Delano, Minn.

Obituary

C. C. Cartwright of Portland, Ind., died at his home there recently. Mr. Cartwright was president of the Midwest Stone Co. of Portland.

L. L. Kolesar, 35, met his death on September 9 at the mines of the American Gypsum Co. near Port Clinton, O., when the ceiling of one of the rooms in which he was working caved in. Mr. Kolesar was caught under a huge piece of rock and, despite the efforts of fellow workmen to extricate him, he died before the stone slab could be removed. He leaves a widow and one child.

A. D. Quinn, sales manager of the Industrial Division of the L. H. Gilmer Co., Philadelphia, died Sept. 17 while in Chicago on a business trip. Death was due to heart disease. Mr. Quinn was born in Camden, N. J., January 13, 1887. In October, 1919, he became associated with the Gilmer company and in 1922 was placed in charge of the sales of the Industrial Division. Under his splendid leadership this division showed phenomenal growth. To him belongs a major share of the distinction of placing the Gilmer V-Belt, along with other industrial products in the prominent position which they now occupy in the industrial world.

Traffic News and Comment

Recent I. C. C. Decisions

Agricultural Limestone.—The rates on ground, pulverized or agricultural limestone from Waukesha, Wis., to destinations in the lower peninsula of Michigan, have been found not unreasonable but unduly prejudicial to complainant and unduly preferential of his competitors in Michigan to the extent that the rates from Waukesha to destinations in Michigan exceeded rates for equal distances applicable within the lower peninsula of Michigan with the addition of arbitraries for joint line movements as provided under the Michigan intrastate scale. Undue prejudice is to be removed not later than December 9. While reparation was denied, Commissioner McNamany dissented in part, saying that he thought the rates should be held unreasonable, that the finding on the first section phase of this case was in direct conflict with National Mortar & Supply Co. v. Ann Arbor, 152 I. C. C. 429. I. C. C. Docket No. 23,609, R. H. Smelter *v.* Ann Arbor *et al.*

New Complaints Filed

Ground Limestone.—The Commission has suspended from Sept. 9, to April 9, schedules in Supplement No. 86 to Glenn's I. C. C. No. A-737, supplement No. 85 to Glenn's I. C. C. No. A-745, supplement No. 35 to Speiden's I. C. C. No. 1,397, and other agency and individual tariffs which propose to cancel the present commodity rates on stone, limestone, granite, marble or slate (crushed, ground, pulverized or powdered) and related articles, including articles grouped therewith, in straight or mixed carloads, interterritorial, between points in the south on the one hand, and points in official, western and trunk-line territories, on the other hand, also between points in the south and southern gateways and Ohio and Mississippi River crossings in-so-far as they apply on traffic between points in the south on the one hand, and points in official, western, trunk-line and southwestern territories, on the other, allowing the classification basis or combination rates to apply, which would generally result in increases. I. C. C. Docket I. & S. No. 3,638.

Fourth-Section Relief

Cement.—Subject to the usual restrictions regarding circuity, the commission has granted relief from the provisions of the long-and-short haul clause of the fourth section on rates on cement from Laramie, Wyo., to points in Arkansas, Louisiana west of the Mississippi River, Oklahoma, and Texas except destinations in west Texas, covered by the report in Docket No. 20,821, Oklahoma Portland Cement Co. *v.* A. T. & S. F. Ry. Co., 163 I. C. C. 249. Rates over the short line or route are to be constructed on the basis of the distance scale prescribed in the above report, shown below. The carriers are authorized to publish, in lieu of specific routing between points of origin and destination, a general rule or rules showing rates and maximum distances for routing in accordance with the method and subject to the same limitations as were prescribed in the report in Western Cement Rates, 132 I. C. C. 273. Other relief prayed for in Leland's application No. 14,447 was denied. F. S. O. No. 10,717.

Miles	Rate	Miles	Rate	Miles	Rate
5	$0.09	600	$0.29½	1360	$0.52
15	.10	620	.30	1380	.52½
30	.10½	640	.31½	1400	.53
35	.11	660	.32	1420	.53½
60	.11½	680	.32½	1440	.54
75	.12½	700	.33	1460	.54½
80	.13	720	.33½	1480	.55
95	.13½	740	.34	1500	.55½
110	.14	760	.35	1520	.56
120	.14½	780	.35½	1540	.56½
130	.15½	800	.36	1560	.57
170	.16	820	.37	1580	.57½
180	.16½	840	.37½	1600	.58
210	.18	860	.38	1620	.58½
220	.18½	900	.38½	1640	.59
240	.19	920	.39½	1660	.59½
250	.19½	940	.40½	1680	.60
270	.20	980	.41	1700	.60½
290	.20½	1020	.42½	1720	.61
310	.21	1040	.43	1740	.61½
330	.21½	1060	.43½	1760	.62
350	.22	1080	.44	1780	.62½
360	.22½	1120	.45½	1800	.63
370	.23½	1140	.46	1820	.63½
390	.24	1180	.47	1840	.64
430	.24½	1200	.48	1860	.64½
450	.25	1220	.48½	1880	.65
470	.26	1240	.49	1900	.65½
490	.26½	1260	.49½	1920	.66
500	.27	1280	.50	1940	.66½
520	.27½	1300	.50½	1960	.67
540	.28	1320	.51	1980	.67½
560	.29	1340	.51½	2000	.68

Limestone. — Fourth-section order No. 10,671, has been further modified and amended so as to provide that the relief authorized therein with respect to limestone or marble, (crushed, ground or pulverized to fineness to pass through a screen of 5/16-inch mesh) including stone dust in bulk or in bulk in bags, c. l. min. wt. 60,000 lb., shall also include marl in bulk or in bulk in bags, c. l. min. wt. 60,000 lb.

Rate-Committee Dockets

New England Freight Assn.

Crushed Stone.—To meet motor-truck competition carriers propose to reduce the rate on crushed stone (trap rock)[1], from Westfield, Mass., to Oak Street, Mass., from 90 cents to 50 cents a net ton. Docket No. 23,430.

Trunk Line Assn.

Crushed Stone.—To meet motor-truck competition shippers propose a reduction in the rate on crushed stone[1] from Tyrone Forge, Pa., to Phillipsburg, Pa., from 70 cents to 60 cents a net ton, to expire Jan. 1, 1932. Docket No. M-1, 849.

Fluxing Lime.—Carriers propose to amend the description on fluxing lime to read, "Fluxing lime, having no commercial value for chemical or building purposes," in connection with various rates between points in Trunk Line Association territory. A list of rates affected will be furnished on request. Docket No. 27,599.

Lime.—Carriers propose to establish on lime, (A) building, and (B) agricultural, land, chemical, gas and glass, also ground limestone, c. l. min. wt. 30,000 lb., except ground limestone 50,000 lb., from Exton, Cedar Hollow, Howellville, Mill Lane, Shainline, Swedeland, Williams, Cold Point and Conshohocken, Pa., to Kingston, N. Y., (A) 17 cents, (B) 16 cents, and to Walkill Valley Branch and West Shore R. R., (A) 21½ cents and (B) 20½ cents; same as currently in effect from Knickerbocker and DeVault, Pa. Docket No. 27,621.

Sand and Gravel.—To meet motor-truck competition it is proposed to reduce the rate on common sand and gravel[1] from Otisville, N. Y., to Endicott, N. Y., from $1.30 to $1.10 a net ton. Docket No. M-1,859.

Stone Dust.—To meet motor-truck competition shippers propose a reduction in the rate on stone dust[1] from Bound Brook, N. J., to South Bound Brook, N. J., from 70 cents to 60 cents a net ton. Docket No. 27,616.

Sulphur.—Shippers at Suscon, Pa., propose a reduction in the rate on sulphur (brimstone), c. l. min. wt. 60,000 lb., to LeRoy, N. Y., from 25 cents to 22 cents per 100 lb. Docket No. 27,607.

Central Freight Assn.

Crushed Stone.—Shippers at Calcite, Mich. (near Rogers City), are proposing a reduction in the rate on crushed stone to South Milwaukee, Wis., from $5.50 to $2.27 a net ton. Docket No. 29,305.

Roasted Dolomite.—Carriers propose to establish a rate of $1.69 a net ton on roasted dolomite[1] from Narlo, Ohio, to Huntington, W. Va. The present rate is $2.50 (60 per cent. of sixth class). Docket No. 29,311.

Sand and Gravel.—Carriers propose to establish on sand and gravel, in open-top cars, c. l., regardless of weight, from the proposed siding of the Ohio Gravel Co., ¾ mile east of Newtown, O., to destinations on the N. & W., within the switching limits of Cincinnati, O., a rate of $10.00 per car, except to C. L. & N.-N. & W. deliveries at Avondale, O., Hunt Street, O., Court Street, (Cincinnati) O., $20.00 per car, to expire with Dec. 31, 1932. At present the intermediate application of the 30 cents per ton rate from Gravel Pit, O., applies. Docket No. 29,330.

Slag.—Carriers propose to establish a rate of 95 cents a net ton on slag[1], from South Chicago, Ill., to Gleason, Ind., to apply via the usual available

routes except the C. I. & L. direct. The class rate now applies. Docket No. 29,310.

Illinois Freight Assn.

Molding Sand.—It is proposed to establish a rate of $1.15 a net ton on molding sand,[1] from Fayv.lle and Thebes, Ill., to East St. Louis, $1.39 a net ton to St. Louis, when for deliveries on lines other than the Mo. Pac., and $1.27 a net ton for delivery on Mo. Pac. rails. Docket No. 6,300.

Texas-Louisiana Tariff Bureau

Lime.—It is proposed to establish a rate of 17½ cents per 100 lb., c. l. min. wt. marked capacity of car, but not less than 30,000 lb., from Lime City and Oglesby to Beaumont, Port Arthur and Orange, shipside, for export. This rate will not include terminal charges at the ports. Docket No. S-5,

Trans-Continental Freight Bureau

Lime.—Carriers propose to amend Item 3,815 of Trans-continental Tariff 1-J by providing for a proportional rate of 50 cents per 100 lb., on lime, c. l. min. wt. 60,000 lb., from Nemo, Ill., to California; to apply on traffic originating at Sandusky, Tiffin, Gibsonburg and Woodville, O. Docket No. 12,325.

Mica Ore.—Shippers request that the description of item 1,420 of Transcontinental Tariffs 1-J and 4-G, reading "Mica schist, crude or ground," be amended to read, "Ground mica ore." Docket No. 12,864.

[1] The carload minimum weight will be 90 per cent. of the marked capacity of the car except when loaded to full cubical or visible capacity, actual weight will apply.

Forms Connection With Engineering Associates

The Pennsylvania Pump & Compressor Company, of Easton, Pa. has formed a connection with Byer Engineering Associates, of the same city, with branch offices at 136 Liberty St., New York, and 1328 Chestnut St., Philadelphia. Byer Engineering Associates specialize in direct-contact condensing and cooling apparatus, barometric and low-level jet condensers, reciprocating and steam-jet vacuum pumps, gas-washing apparatus and allied centrifugal pumps for use in connection with this equipment. Henry E. Byer, head of Byer Engineering Associates, is well known in the condenser field, having specialized for the past twenty years in the manufacture, application and operation of vacuum apparatus while connected with the Ingersoll-Rand Co. and Chicago Pneumatic Tool Company.

Birthplace of Portland Cement Damaged by Fire

Fire broke out recently in Leeds, England, according to press dispatches, and for a time threatened the whole business district with destruction. After twelve hours of effort, the flames were finally brought under control. The damage amounted to $1,250,000.

This incident might well be termed the "Fire Demon's Revenge" as it is remembered that Leeds was the birthplace of Portland cement, now extensively and successfully used as a fireproofing and structural material. In 1824, Joseph Aspdin, a Leeds bricklayer, by chance combined certain quantities of lime and clay, burned them in a kiln, and found that the resulting mass when pulverized and combined with water would become as hard as stone. He named his new cement "Portland," because it resembled a building stone quarried on the Isle of Portland, and secured a patent on it.

Locate Huge Limestone Deposit in Washington

More than 300,000,000 tons of limestone are estimated to be contained in a deposit five miles west of the head of Lake Wenatchee, according to John D. Atkinson, Wenatchee, Wash., prospector, who added that he believes the deposit to be the largest single body of limestone west of the Rocky Mountains.

The deposits cover about a thousand acres in blanket formation and are of high-class marble limestone, running about 95 per cent. pure in carbonate of lime, it is claimed. Tests also show enough alumina shales in the vicinity to operate a large Portland-cement plant for 150 years, Mr. Atkinson declared in an interview published in the *Seattle Times*. Cement manufacturers are said to be studying the deposits, according to the *Times*.

Book Review

ROTIER- UND SCHACHTOFEN-PORTLANDZEMENTE: ERGEBNISSE 8- UND 4-JAHRIGER UNTERSUCHUNGEN (Rotary and Shaft-Kiln Portland Cements: Results of 8- and 4-year investigations), *by Dipl. Chemiker Joseph Keith. Graupen bei Teplitz-Schönau, Czechoslovakia; privately printed, 1931. 28 pp.* The author publishes in this booklet, well illustrated with tables and graphs, an independent study and summary of the routine tests on Czechoslovakian commercial cements made by the Deutscher Material-Prüfuns-Verband i. d. tschsl. Republik (German Material-Testing Society in the Czechoslovak Republic). Tests on Portland cements, made over the 8-yr. period from 1922 to 1929, cover 32 brands of cement produced in rotary kilns and 61 produced in shaft kilns. The study shows an undoubted superiority of the average rotary-kiln cement over the average shaft-kiln cements—a result, however, which the author qualifies by reference to excellent results given by some of the modern automatic shaft kilns with revolving grates. Tests on special or high-strength Portland cements began in 1926, and the 4-yr. record of these cements is also examined here. Czechoslovakia has now no standard specification for these cements, and the author finds the strength and rapid-hardening qualities of the cements actually produced so high that the adoption of such standard specifications is urgently recommended.

Kentucky Rock Asphalt Halts 1930 Production

Production of rock asphalt at the Kentucky Rock Asphalt Co. quarries in Edmonson county, near Bowling Green, Ky., is being discontinued for the fall and winter months.

The *Walter Jr.*, one of the towboats operated by Capt. Walter Houghland in towing asphalt rock for the company has been tied up at the company's landing at Bowling Green and the *Helen H* will be tied up shortly, it is reported.

Storage piles of the company contain enough of the road building material to fill orders that will be received before production is resumed next spring.

Coast Gravel Plant Has 100-Ton Hourly Output

One of the most important recent developments in the aggregate industry on the Pacific Coast was the putting into operation of a new sand-and-gravel plant by the Piru Rock Co., Ltd. This new plant, which has a capacity of 100 tons per hr., is located at Piru, Cal., about 50 mi. northwest of Los Angeles. This capacity will be doubled by the installation of an additional crusher. The officers of the company are: H. W. Jones, president; J. H. Lemmon, vice-president and operating manager, and Geo. H. Grabe, secretary and treasurer. Mr. Jones and Mr. Grabe were both formerly with the Associated Rock Co. of Los Angeles.

Remodels Warehouse for Servicing Motor Trucks

In connection with its new concrete-mixing and distributing plant being established by the Arundel-Brooks Concrete Corp., Baltimore, Md., recently organized, on property on South Wolfe Street, with waterfront facilities, the company will remodel a four-story warehouse unit on the site for housing and servicing motor trucks. The concrete-mixing plant will have an initial capacity of 1,000 cu. yd. a day, and it is proposed to increase the output later to 3,000 cu. yd. All machinery will be of the automatic type. The project will represent an investment of close to $90,000. W. B. Brooks, Jr., an official of Sanford & Brooks Co., contractor, is president of new organization and R. A. Froehlinger is secretary and treasurer.

Financial News

The information contained in these financial pages is given with the understanding that any statement on the part of this magazine or any of its staff, as to the responsibility or standing of any person, firm or corporation, or as to the value of any property or securities is a mere expression of opinion, given as a matter of service to the readers of PIT AND QUARRY, *for which no responsibility in any way is to attach to this magazine or to any of its staff.*

Canada Cement Earnings Should Equal 1930 Net

Business of the Canada Cement Co., Ltd., has held up well this year, and earnings are likely to equal, or nearly so, those of 1930, according to the *Wall Street Journal.* Construction work, being undertaken by city governments and provincial governments as part of the dominion-wide efforts to relieve unemployment, has helped to maintain the demand for cement. At the same time, important orders have come in for a number of large power developments under way in Canada, and the construction of the new Canadian National Railways terminal at Montreal has required a large quantity of the company's product.

Small orders and retail business have, like last year, been relatively low, due to the general business situation.

Canada Cement Co., Ltd., for the fiscal year ended November 30, 1930, reported net income, after all charges, including interest and provision for depreciation, reserves, etc., of $1,566,014, equal after preferred dividends to 34 cents a share on 600,000 shares of no-par common.

Report of International Agricultural Corporation

Report of International Agricultural Corp. and affiliated companies for year ended June 30, 1931, shows net profit of $60,677 after interest, depreciation, depletion, etc., equal to 60 cents a share on 100,000 shares of 7 per cent. prior preference stock, on which there is an accumulation of unpaid dividends. This compares with $1,526,176 or $15.26 a share on prior preference stock in preceding fiscal year, and after allowing for only regular annual dividend requirements on prior preference stock, to $1.83 a share on 450,000 no-par shares of common stock.

Consolidated income account for year ended June 30, 1931, compares as follows:

	1931	1930
Gross profit	$2,850,125	$4,382,682
Expenses	1,897,492	1,836,925
Oper. profit	$ 952,633	$2,545,757
Other inc.	84,552	121,453
Total inc.	$1,037,185	$2,667,210
Interest	448,498	469,713
Depr. and depl.	532,363	604,323
Profit	$ 56,324	$1,593,174
Prof. bds. prch.	4,353	68,002
Profit	$ 60,677	$1,661,176
Fed. taxes	.....	135,000
Net profit	$ 60,677	$1,526,176
*Pr. prf. divs.	525,000	525,000
Deficit	$ 464,323	†$1,001,176

* In 1931, 5¼%; 1930, 5¼%. † Surplus.

Consolidated balance sheet of International Agricultural Corp. and affiliated companies as of June 30, 1931, compares as follows:

Assets

	1931	1930
R. E., plants, equip., etc.	$24,751,479	$24,087,940
Cash	1,330,992	1,629,074
Accounts and notes rec.	5,046,886	5,522,842
Inventories	3,289,297	2,504,887
Due fr. subs.	944,634	1,479,999
Investments	646,886	645,845
Unmined phos. property	64,837	56,824
Deferred chgs.	179,488	201,142
Skg. fund cash	17	786
Total	$36,254,516	$36,129,389

Liabilities

Prpfd. stock	$10,000,000	$10,000,000
*Com. stock	2,250,000	2,250,000
Bonds	7,112,100	7,444,600
Accts. pay.	285,428	221,226
Notes payable	1,000,000	.....
Accrd. int., etc.	173,882	242,565
Federal taxes	.....	135,000
Special res.	5,466,430	5,404,998
†Exc. assets	9,966,676	10,431,000
Total	$36,254,516	$36,129,389

* Represented by 450,000 no-par shares. † Excess assets over required declared capital.

In remarks accompanying the annual report, John J. Watson, president, said in part: "Bonds amounting to $332,500 have been retired during the year through the operation of the sinking fund. The increase shown in the plant account is largely represented by additions and improvements to the facilities of the Florida phosphate-rock division which should produce substantial savings.

"The management decided to restrict sales as far as possible to the highest class of customers and to do business on a cash basis as much as possible in order to minimize credit risks. As a result, a larger inventory was carried over than is usual. Owing to the abnormal credit situation in the cotton belt a larger provision was made for credit losses on this year's sales.

"Present indication is that a strong effort will be made to reduce acreage planted next season which may mean a material reduction in tonnage of fertilizers next year. Reduced fertilizer consumption has resulted in a corresponding reduction in the use of phosphate rock both here and abroad. Our phosphate rock flotation plants are operating on a successful basis and are producing an increased tonnage of greatly improved product."

Arundel Corp. Earnings Exceed Dividend Needs

The Arundel Corp. of Baltimore, Md., has declared the regular quarterly dividend of 75 cents, payable October 1 to stock of record September 21.

August net income was $225,011, against $222,812 in August, 1930. Current assets on August 31 amounted to $4,196,577, and current liabilities to $487,508.

The corporation reports for the eight months ended August 31, 1931, net profit of $1,524,031 after depreciation, depletion, federal taxes, etc., equivalent to $3.07 a share on 495,556 shares of no-par capital stock. This compares with $1,730,155, or $3.51 a share, in first eight months of 1930.

State-Owned Cement Mill Reports for Six Months

The South Dakota Cement Commission reports that the state-owned cement plant at Rapid City, S. D., has made a net profit for the first six months of this year of $54,540. The report also shows gross sales of $613,915 and gross profits of $98,722.

CURRENT DIVIDENDS

COMPANY	CLASS OF STOCK	DIVIDEND RATE	HOLDERS OF RECORD	PAYABLE	COMPANY	CLASS OF STOCK	DIVIDEND RATE	HOLDERS OF RECORD	PAYABLE
Alpha Portland Cement	Preferred	$1.75 qr.	Sept. 1	Sept. 15	National Gypsum Co	Preferred	$1.75 qr.	Sept. 15	Oct. 1
Arundel Corp	Common	$0.75 qr.	Sept. 21	Oct. 1	Pittsburgh Plate Glass	Common	$0.50 qr.	Sept. 10	Oct. 1
Canada Cement	Preferred	$1.62½ qr.	Sept. 31	Sept. 20	Pennsylvania Glass Sand	Preferred	$1.75 qr.	Sept. 15	Oct. 1
Cleveland Quarries	Common	$0.75 qr.	Aug. 15	Sept. 1	Raybestos-Manhattan	Common	$0.40 qr.	Aug. 31	Sept. 15
General Asphalt	Common	$0.50 qr.	Sept. 1	Sept. 15	Republic Portland Cement	Preferred	$1.75 qr.	Aug. 15	Sept. 1
Ideal Cement	Common	$0.50 qr.	Sept. 15	Oct. 1	Schumacher Wallboard	Preferred	$0.50 qr.	Nov. 5	Nov. 15
International Cement	Common	$1.00 qr.	Sept. 1	Sept. 30	Superior Portland Cement	Class A	$0.27½M	Sept. 23	Oct. 1
International Salt	Common	$0.75 qr.	Sept. 15	Oct. 1	Texas Gulf Sulphur	Common	$0.75 qr.	Sept. 1	Sept. 15
Johns-Manville	Common	$0.75 qr.	.....	Oct. 15	U. S. Gypsum	Common	$0.40 qr.	Aug. 15	Sept. 30
Johns-Manville	Preferred	$1.75 qr.	.....	Oct. 1	U. S. Gypsum	Preferred	$1.75 qr.	Aug. 15	Sept. 30
Kelley Island Lime & T.	Common	$0.50 qr.	Sept. 24	Oct. 1	Warner Co	Common	$0.25 qr.	Sept. 30	Oct. 15
Kentucky Rock Asphalt	Preferred	$1.75 qr.	.....	Sept. 1	Warner Co	1st Pfd.	$1.75 qr.	Sept. 15	Oct. 1
Lehigh Portland Cement	Preferred	$1.75 qr.	Sept. 14	Oct. 1	Warner Co	2nd Pfd.	$1.75 qr.	Sept. 15	Oct. 1

Review of Foreign Practice

The Strength of Cement After Repeated Setting

Although there is mention in the older cement literature that a cement ground after it has set is capable of setting again, this fact seems to be little known. It has considerable practical significance and, in addition, adds evidence to the Michaelis-Kühl theory of the hardening of cement. The investigations reported here were carried out at the laboratory of the Pommersche Industrie-Verein, Wolgast (Series I to III) and at the Chemisches Laboratorium für Tonindustrie (Chemical Laboratory for the Clay Industry), Berlin (Series IV). All were made in standard mortar tests. Series I dealt with set lumps of cement which had formed on the walls of a cement silo penetrated by rain; the lumps were very hard, and were broken with a heavy hammer and ground in a Griffin mill without the addition of gypsum. Series II tested specimens employed in the Vicat and other tests in the laboratory, ground in a Griffin mill without gypsum. In Series III the soundness-test specimens that had been stored four months under water were dried and ground, also in the Griffin mill and with no addition of gypsum. This material had a surprisingly high loss on ignition of 11.12 per cent. Testing with dilute hydrochloric acid showed that this was due in large part to carbon dioxide. In Series IV 10 kg. of a commercial cement was mixed with 3 liters of water, formed into balls about 6 cm. in diameter, stored four months in the air, and ground in the laboratory ball-mill without the addition of gypsum. This product was then compared with the original cement. The results of these investigations are summarized in the tables.

It might be assumed that the greater fineness of Series II cement accounts for its higher strength as compared with I and III, but comparison with IV shows this is not so. The greater strength in Series II can only be explained by the assumption that air storage works more beneficially than the continuous water storage of Series III and the probably-repeated moistening of Series I. The rapid set, both final and initial, is also worthy of note, and it is natural to assume that in Series III the gypsum content was leached out by the 4-mo. storage under water. Actually the analysis of this cement showed a content of only 0.043 per cent. SO_3, corresponding to 0.073 per cent. of anhydrous gypsum or 0.092 per cent. of double hydrate, while the SO_3 content of the original cement was 1.4 per cent.

In general the investigations show that a considerable capacity for hardening remains in set cement, which thus is no mere ballast when mixed with fresh clinker but even figures in the hardening of the mixture. Cements stored under water (*e. g.*, in submerged barrels or sacks), however, should have more gypsum added in grinding.—Dr. K. A. Goslich, *Tonindustrie-Zeitung*, 55: 969-70, Aug. 24, 1931.

Table I.—FINENESS, SPECIFIC GRAVITY, TIME OF SET

	Residue		Weight per Liter (*Grams*)		Setting Time		Air Humidity	Mixing Water (*Per Cent.*)	Temperature Rise (*Deg.C.*)
	900-Mesh (*Per Cent.*)	4900-Mesh (*Per Cent.*)	Loose	Rodded	Initial (*Hr.*)	Final (*Hr.*)			
Set Cement I	0.15	11.5	837	.....	.....	.....	.....	28	.....
Set Cement II	.....	4.0	900	1120	2:00	4:30	.....	27	.....
Set Cement III	.....	15.0	880	1380	0:30	2:30	.....	28.5	.....
Set Cement IV	1.0	10.0	.....	.....	1:21	3:11	62	29	1.8
Original Cement IV	0.3	12.3	.....	.....	3:46	5:21	62	27	1.8

Table II.—STRENGTH IN STANDARD 1:3 MORTAR (8.5 PER CENT. WATER)
(*Kg./cm²*)

	3 Days[1]		7 Days[1]		14 Days[1]		28 Days[1]		28 Days Combined[2]	
	Tensile	Compressive	Tensile	Compressive	Tensile	Compressive	Tensile	Compressive	Tensile	Compressive
Set Cement I	.....	20	.....	49	.....	.....	.....	.....	.....	109
Set Cement II	5.1	48	9.8	93	.....	.....	.....	.....	17.3	172
Set Cement III	3.2	44	6.6	50	.....	.....	.....	.....	8.8	99
Set Cement IV	6.5	47	10.8	92	16.7	128	20.3	159	22.7	183
Original Cement I-III	.....	190	.....	280	.....	.....	.....	.....	.....	430
Original Cement IV	21.6	179	27.7	305	29.9	359	30.9	396	40.4	455

[1]Water storage: 1 day in air, remainder under water. [2]Combined storage: 1 day in air, 6 days under water, 21 days in air.

Coal-Mill Chain Drive Proves Its Efficiency

Installation of an inclosed silent-chain drive of a size hitherto unprecedented in Germany was made last year at a cement plant in Beckum, Westphalia, connecting a 350-hp., 750-r.p.m. motor to a coal-grinding mill. The drive has been found highly practical. It has an efficiency of between 98.5 and 98.9 per cent., is positive and safe in operation, yet has sufficient flexibility to be installed without flexible couplings. It makes so little noise that the hum of the motor can be heard above it. It was installed on April 3, 1930, and on the latest inspection it was reported to be as good as the day it went into service.—*Tonindustrie-Zeitung* 55: 949-950, Aug. 17, 1931.

French Stone Producer Modernizes Two Plants

The Société des Carrieres de la Vallee Heureuse et du Haut Banc operates three limestone and marble quarries in the departement of Pas-de-Calais, France, known respectively as Vallee Heureuse, Basse Normandie and Haut Banc. The stone at Vallee Heureuse is a hard limestone of 99 per cent. pure calcium carbonate, while that at the other two quarries is dolomitic limestone with benches of dolomite. At Vallee Heureuse the deposit has a depth of several hundred meters, but the face now worked is 800 m. long and 36 m. high (2,625 ft. by 118 ft.) and it is not likely that quarrying will go any deeper, because of the many springs and the difficulties of dewatering. The Vallee Heureuse quarry in 1900 was equipped with two 700-mm. by 400-mm. (28-in by 16-in.) jaw crushers and a rotary screen, and pneumatic drilling was introduced in the same year. A duplicate screen was added in 1926 and in 1929 a Bucyrus-Erie 50-B shovel replaced hand-loading at the face. In 1930 the whole operation was expanded by the installation of a large new primary-crushing and screening plant, using the older machines for secondary reduction and screening.

A similar enlargement has been effected at the Basse Normandie quarry, which was opened in 1910 with a 700-mm. by 400-mm. jaw crusher and a rotary screen. The plant, furnishing mainly ballast and road stone, was doubled in 1929 by the installation of duplicate crushing and screening units, and in the same year the company installed there a 50-B Bucyrus-Erie shovel and two Keystone drills, as at the first quarry. Then in 1930 a complete primary crushing and screening plant with the same essential equipment as at Vallee Heureuse was constructed. The Basse Normandie plant works a quarry face that is at present 300 m. long and 28 m. high (985 ft. by 92 ft.), and has an annual production of 300,000 metric tons.—Ch. Puech in *Pierres et Minerais* (Brussels), 3:391-396 and 402-404, June and July, 1931.

Recent Patents

AMERICAN

Cement and Concrete

Apparatus for handling cement or like material in bulk. Morris Kind, Bryn Mawr, Pa., assignor to Hercules Cement Corp., Philadelphia, Pa. No. 1,822,530.

Device for the proportionate feeding of mixing ingredients to concrete and mortar-mixing machines. Robert Hahn, Neunkirchen, Germany. No. 1,823,270.

Method of producing porous concrete. Karl P. Billner, New York, N. Y., assignor to Aerocrete Corp., same place. No. 1,823,343.

Crushing and Grinding

Process and apparatus for pulverizing material. Michael D. Jones, Allentown, Pa., assignor to Fuller-Lehigh Co., Fullerton, Pa. No. 1,822,221.

Apparatus for grinding and separating materials. Herman F. Dubbert, Port Clinton, O., assignor to American Gypsum Co., same place. No. 1,822,647.

Pulverizing mill. Claudius Peters, Hamburg, Germany. No. 1,822,999.

Grinding ball. Warren F. Clements, Allentown, Pa., assignor to Fuller Lehigh Co., Fullerton, Pa. No. 1,823,351.

Excavating

Excavator. Clinton A. Clemens, Retsil, Wash. No. 1,822,338.

Power-dipper trip. Alpheus E. Holcomb, Milwaukee, Wis., assignor to Koehring Co., same place. No. 1,822,403.

Power shovel. Earl H. Fundom, Lima, O., assignor to Fundom Hoist & Shovel Co., same place. No. 1,823,137.

Excavator. Arthur Orloff, Green Bay, Wis., assignor to Northwest Engineering Corp., same place. No. 1,823,662.

Materials Handling

Earth-handling structure. Philip T. Robin and Carl J. Scheleske, Erie, Pa., assignors to G. H. Williams Co., same place. No. 1,822,423.

Screening and Separating

Vibrating screen. Carl G. A. Schmidt, Jr., Kennett Square, Pa., assignor to American Road Machine Co., same place. No. 1,822,507.

Self-cleaning, non-clogging traveling grizzly. Jonas Lien, Port Washington, N. Y. No. 1,822,739.

Grizzly and screen for grading materials. William Ross, Surbiton, England. No. 1,823,126.

Rack-screen cleaner. William A. Dundas and Lloyd M. Johnson, Chicago, Ill. No. 1,823,823.

Process and mechanism for separating intermixed divided materials. Kenneth Davis, Ebensburg, Pa., assignor to Peale-Davis Co., Wilmington, Del. No. 1,823,848.

FOREIGN

Blasting

Process of and device for maintaining blasting explosive charges in boreholes. H. Kruskopf. British 351,998.

Explosive. Canadian Industries, Ltd., Montreal, Que., assignee of Charles C. Ahlum, Chester, Pa. Canadian 315,020.

Safety fuse for mining and blasting. Johannes Fritzsche, Wiener-Neustadt, Austria. Canadian 315,155.

Cement and Concrete

Method of treating concrete and the like. M. Giese and F. Hell. British 352,676.

Process for producing dense concrete. Sebastian Körbl, Munich. German 532,755.

Process for production of cellular concrete or the like. Gustave Hory, Paris. German 533,231.

Crushing and Grinding

Crushing-plates for stone crushers. Raimund Hengl, Limberg, Austria. German 533,077.

Bearing for the free roller of roll crushers. Esch-Werke Kom. Ges. Maschinenfabrik u. Eisengiesserei, Duisburg-Hochfeld, Germany. German 533,078.

Grinding device. Swinfen Bramley-Moore, New York, N. Y. German 533,079.

Pulverizer. Erie City Iron Works, assignee of Gustav Henry Kaemmerling, Erie, Pa. Canadian 315,035.

Cone crusher. The Nordberg Manufacturing Co., Milwaukee, Wis., assignee of Edgar B. Symons, Los Angeles, Cal. Canadian 315,076.

Jaw crusher. The Nordberg Manufacturing Co., Milwaukee, Wis., assignee of Edgar B. Symons, Los Angeles, Cal. Canadian 315,077.

Drilling

Lubricating-device for the lubrication of fluid-pressure-operated tools, such as rock drills, pneumatic hand drills, or the like. H. S. Potter. British 351,707.

Well-drilling plant. O. M. C. Gahayan. British 352,126.

Fluid-pressure distributing means for percussive tools. Ingersoll-Rand Co. British 352,310.

Hand-held compressed-air hammer drill. Dipl.-Ing. Joseph Maercks, Bochum, Germany. German 532,763.

Hammer-drill holding apparatus. Albrecht Sartor, Siegen i. W. German 532,527.

Feeding device for rock drills. Ingersoll-Rand Co., New York, N. Y., assignee of W. A. Smith, Sr., Easton, Pa., and W. A. Smith, Jr., Phillipsburg, N. J. Canadian 315,263.

Charging device for drill holes. Ingersoll-Rand Co., New York, N. Y., assignee of Charles C. Hansen, Easton, Pa. Canadian 315,264.

Feeding device for percussive motors. Ingersoll-Rand Co., New York, N. Y., assignee of W. A. Smith, Sr., Easton, Pa. Canadian 315,265.

Drying

Method of and apparatus for drying materials. L. N. Lloyd and Phillips Engineering Co., Ltd. British 351,976.

Drying-apparatus, and particularly apparatus of the continuously-operating type. Soc. Anon. des Etablissements New. British 352,363.

Excavating and Stripping

Mobile cranes and excavators. J. S. Withers (Koehring Co.) British 351,414.

Convertible shovel or grab navvy. Demag Akt.-Ges. British 351,463.

Bridge-conveyor with drag scraper as excavating unit. Mitteldeutsche Stahlwerke Akt.-Ges., Berlin. German 533,119.

Device for removing strippings. Maschinenfabrik Husencleven Akt.-Ges., Dusseldorf. German 532,967.

Excavating and conveying apparatus with cableway. Lübecker Maschinenbau-Gesellschaft, Lübeck. German 533,120.

Trip device for power-shovel dippers. Louis James Gallagher, et. al., Toronto, Ont. Canadian 315,327.

Kilns

Material-feeding and drying device for kilns, particularly for the burning of cement, and process for the operation of this device. Arno Andreas, Münster i. W. German 532,626.

Lime

Production of materials adapted to be molded and fired from raw material containing lime. B. Jirotka. British 352,665.

Material-Handling

Belt conveyors. T. G. Nyborg and M. F. Higgins. British 351,582.

Conveyor belts. Leyland & Birmingham Rubber Co., Ltd., and R. W. Lunn. British 351,721.

Conveyors. W. E. Evans (Demag. Akt.-Ges.). British 351,785.

Conveyors, shoots, and hoppers. G. G. Wilson and Goodall, Clayton & Co., Ltd. British 352,246.

Jigging conveyors. T. B. Wilkinson. British 352,569.

Chain conveying-apparatus. A. Marone. British 352,654.

Belt and like conveyors. G. J. Fisher. British 352,854.

Apparatus for unloading fine materials from railway cars. Dr.-Ing. Ar-

PIT AND QUARRY will furnish, at its actual cost, a copy of any patent cited here. A charge of ten cents per copy is made by the U. S. Patent Office, Washington, D. C., and readers may procure a copy directly by addressing the Commissioner of Patents, with payment for copies requested. Postage stamps are not accepted by the Patent Office. We will endeavor to obtain copies of foreign patents for our readers but we cannot give assurance in every case for the reason that copies of such patents are not printed for distribution as liberally as are the American copies, nor is there a fixed charge per copy.

thur Gerke, Schloss-Waldenburg i. Schles. German 533,304.

Connection for shaking conveyor. Förster'sche Maschinen und Armaturenfabrik Akt.-Ges., Essen-Altenessen. German 533,103.

Connection for shaking conveyor. Hauhinco Maschinenfabrik G. Hausherr, E. Hinselmann & Co., G. m. b. H., Essen. German 533,440.

Apparatus for conveying pulverulent bulk material by means of compressed air. G. Polysius Akt.-Ges., Dessau. German 533,305.

Feeding-hopper for pneumatic conveying plant. Georg Ahrens, Elmshorn. German 533,029.

Process of conveying pulverulent material in pipe lines. Ivan Emile Lanhoffer and Edmond Lanhoffer, Paris. German 532,964.

Portable conveyor. Fried. Krupp Akt.-Ges., Essen. German 533,017.

Screw-conveyor protective device. William F. Rieger, Salt Lake City, Utah. Canadian 315,128.

Screening and Separating

Apparatus for separating dust from air. J. W. Jackson, Ltd., and F. W. Neville. British 351,753.

Sieves, screens, strainers, grates or grids for sifting, screening, sorting, draining, straining or filtering purposes. P. Booth and British Wedge Wire Co., Ltd. British 351,849.

Sieving or sifting of aggregate material. London Brick Co. & Forders, Ltd., and G. H. C. Ratcliffe. British 352,155.

Method of and means for separating solids from liquids. R. S. Prior. British 352,236.

Centrifugal apparatus for separating dust, grit and the like from flue or furnace gases. O. B. Jacobsen. British 352,374.

Separation of liquids from fine-grained material. L. Altpeter and Gutehoffnungshütte Oberhausen Akt.-Ges. British 352,645.

Scoop-wheel for sieving. Hildebrandt-Zerkleinerung G. m. b. H., Hannover-Wülfel. German 533,080.

Air separator. Büttner-Werke Akt.-Ges., Uerdingen a. Rh. German 533,413.

Device for screening pulverized material. Allgemeine Elektricitäts-Gesellschaft, Berlin. German 533,414.

Apparatus for separating dust, etc., from air. Pneumatic Conveyance & Extraction (1929), Ltd., London. German 533,081.

Apparatus for electrical precipitation of suspended materials from gases. The International Precipitation Company, Los Angeles, Cal., assignee of Franz Seipp, Frankfurt a/m., Germany. Canadian 315,270.

Apparatus for removing suspended materials from gases. The International Precipitation Co., Los Angeles, assignee of Arno Nattcher and Franz Seipp, Frankfurt a/m., Germany. Canadian 315,269.

Apparatus for electrical precipitation. The International Precipitation Co., Los Angeles, Cal., assignee of Walther Deutsch, Frankfort a/m., Germany. Canadian 315,268.

Collecting electrode for electrical precipitators. The International Precipitation Co., assignee of Cecil B. Clyne, Los Angeles, Cal. Canadian 315,267.

Silica and Sand

Manufacture of articles of silica. British Thomson-Houston Co. British 352,375.

Loading machine for distributing sand, gravel, etc. Eugene Justin Nestor Millet, Paris, France. Canadian 315,174.

Slag

Process of and apparatus for the granulation of liquid slag. A. L. Mond (Vereinigte Stahlwerke Akt.-Ges.). British 351,591.

Unclassified

Manufacturing concrete aggregates. J. E. Greenawalt. British 351,689.

Sintering clay. J. E. Greenawalt. British 351,690.

Wire ropes. Wrights' Ropes, Ltd., and R. C. G. Jenkins. British 351,818.

Guide blocks, pulley blocks, and the like. C. Stinis and M. van der Schans (trading as W. C. Stinis). British 351,861.

Agitation and settling apparatus. W. W. Triggs (Dorr Co.) British 351,989.

Means for removing dust, such as from plant fired with pulverulent fuel. Clarke, Chapman & Co., Ltd., and W. A. Woodeson. British 351,968.

Method and apparatus for detecting mineral and other deposits. Dr. G. Laubmayer. British 352,269.

Process and apparatus for simultaneously corrugating and trimming sheets of asbestos-cement and the like in a plastic condition. L. Kerchove S-V. British 352,594.

Producing asbestos and mineral artificial fibres. W. Ludke. British 352,681.

Manufacture of refractory product from magnesium silicates. Metallges. Akt.-Ges. and V. M. Goldschmidt. British 352,881.

CORRESPONDENCE

Commercial Quarries Penalized

To the Editor:

On Sept. 17, 1931, at Cedar Rapids, the county seat of Linn County, Ia., bids were received for crushed stone for road surfacing, the low bid on the different projects being as follows:

	Per cu. yd.
6,300 cu. yd. complete on road, avg. haul 3¾ mi. at	$1.09½
700 cu. yd. complete on road, avg. haul 4 mi. at	1.25½
850 cu. yd. complete on road, avg. haul 7½ mi. at	1.32½
8,500 cu. yd. complete on road, avg. haul 6 mi. at	1.13
200 cu. yd. loaded into county trucks at quarry at	1.03½
900 cu. yd. loaded into county trucks at quarry at	.88½
400 cu. yd. rubble stone, loaded into county trucks at quarry at	.48½

The bidding blanks contained the following paragraphs:

"1. County will furnish materials from quarry No. 58 or No. 59 as shown on accompanying map.

"2. Specifications of Iowa Highway Commission series 1930 under section 405.9 Class 'A' crushed stone will apply on materials secured from sources other than quarry No. 58 or No. 59. They will also apply on quarry No. 58 or No. 59 in every respect except that the per cent.-of-wear clause is waived."

From the above you will see that the commercial quarries are penalized at the start in making up their bids: first, by having to furnish their own stone, where the county provides the stone for the "road-side" or portable plant; second, the commercial plant must furnish stone that meets the specifications of the Iowa Highway Commission for the class of work bid on. For the portable plant any stone will do, regardless of its per cent. of wear and in this case we know the stone is much softer than that of any of the commercial plants interested in this work. If the stone from these two quarries did not have a higher per cent. of wear, this clause would not be waived.

In addition it has always been the county's practice to have an inspector, who is trained for this work, stationed at the commercial plants to inspect and accept or reject all surfacing material for county work. His daily reports are sent each day to the engineer in charge. Quite often in the case of these "road-siders" there is no inspection by an official of the highway commission, while in this work the inspector will be a county truck driver or rod man who could say the wheels were turning or the truck was loaded to somewhere near capacity.

It would seem that the men who have invested their money in real commercial plants to produce "specification materials at all times of the year are being discriminated against in favor of the man with a one-horse portable plant who stays in the county only long enough to complete his contract and then moves on to greener pastures.

The question is: Do the taxpayers get their money's worth by putting on an inferior material where the per cent.-of-wear clause is waived?

Iowa City, Ia. IOWA PRODUCER.

Manufacturers' Publications

Each publication listed below contains information of interest to nonmetallic mineral producers. Readers may obtain, without charge—except where a price may be stated—and without obligation, copies of any of these publications by writing directly to the manufacturers who publish them. Please mention PIT AND QUARRY *when writing.*

Batching Plants

The Butler Automatic Cement-Weighing Batcher and Bulk-Cement-Handling Plant. 4 p. (Butler Bin Co., Waukesha, Wis.) Describes and illustrates an all-steel plant for handling bulk cement from cars and batching it by weight into trucks.

Cableways

"Efficient Southern Ohio Gravel Plant Finds Business Good." 2 p. (*Sauerman News,* for August - September, 1931. Sauerman Bros., Inc., Chicago, Ill.) An illustrated description of the plant of the Western Hills Sand & Gravel Co. of Cleves, O., with particular reference to its 1-cu. yd. slack-line cableway which operates over a span of 600 ft.

Compressors

Sullivan Vertical Compressors. 12 p. (Bull. No. 83-T. Sullivan Machinery Co., Chicago, Ill.) Describes and illustrates a vertical, direct-motor-driven air compressor of the stationary type, available in 2- and 4-cylinder models with displacement capacities ranging from 117 to 350 cu. ft. per min.

Hoists

Turbinair Portable Hoists. 16 p. (Bull. No. 76-M. Sullivan Machinery Co., Chicago, Ill.) Describes and illustrates single- and double-drum models of compressed-air-driven portable hoists from 3 to 7½ hp. and with vertical-lift capacities of 1,000 and 2,000 lb. at 80 lb. air pressure.

Hydraulics

Hydraulic Tables and Other Data. 32 p. (Bull. No. 25. Baldwin-Southwark Corp., Philadelphia, Pa.) This booklet is not "just another" handbook or data book. The needs of the engineer engaged in the design or use of mechanisms for producing loads by hydraulic means has been foremost in the thought of the compilers. The pipe table is unusual and the data on accumulators, pumps, intensifiers and shock valves is unique. The inclusion of four pages of cross-section paper for the user's own notes is a noteworthy convenience. The spring-design graph and the weight-of-cylinders graph are marked aids in design.

Pipe Supplies

Armco Spiral-Welded Pipe—Protective Coatings. 8 p. (The American Rolling Mill Co., Middletown, O.) A new booklet containing a good deal of engineering information on coatings for spiral-welded pipe, their selection, probable life, and other data.

Pumps

Kimball-Krogh Pumps. 24 p. (Bull. 250. Kimball-Krogh Pump Co., San Francisco, Cal.) Describes and illustrates a line of deep-well, centrifugal turbine pumps. Important users are listed and much engineering data and tables of specifications, friction losses, pump capacities and motor speeds are included.

Stokers

Chain Grate Stokers. (The Babcock & Wilcox Co., New York, N. Y.) Describes a line of chain grate stokers built with all the precision of fine machine tools. The booklet contains full descriptions of the various types of stokers with suitable photographs and line drawings to illustrate each type. Typical setting views are shown, demonstrating the adaptability of the stokers to various types of boilers.

Tracks, Crawler

LaPlante-Choate "Road Layer" Tracks. 16 p. (LaPlante-Choate Manufacturing Co., Cedar Rapids, Ia.) Describes and illustrates a crawler track for application to wagons, trailers and carts in the moving of materials.

Trucks, Diesel

From Coast to Coast. 4 p. (Cummins Engine Co., Columbus, Ind.) An interesting bulletin describing and illustrating the cross-country run of a Diesel-powered truck, hauling a 3½-ton load, for which the fuel cost was but $11.22. According to text, existing records for speed, economy and endurance were broken by the run.

Wire Rope

"The Installation and Care of Shaft Hoist Rope." 5 p. (*Wire Engineering* for August-September, 1931. John A. Roebling's Sons Co., Trenton, N. J.) An instructive, illustrated article explaining the care of hoist cables.

New Corporations

ERIN LIME & STONE CO., Erin, Tenn. $10,000. Charles F. Lovell, G. W. Burgess and T. H. Warren.

SUPERIOR SAND CO., Los Angeles, Cal. $75,000. Horace L. Cook, Attorney, 606 Hill St.; H. C. Millsap, 1613 W. 49th St.; H. C. Campbell, 335 N. Serrano St.; and A. A. Morrison, all of Los Angeles.

FEDERAL MATERIALS CO., Baltimore Trust Bldg., Baltimore, Md. John M. Butler, Continental Bldg., Baltimore, and A. J. Hoffman, Brown Hotel, Louisville, Ky. To mine limestone in Kentucky and Missouri.

WENTZVILLE STONE & QUARRY CO., Wentzville, Mo. Frank G. Arnote.

A. RICHTER CEMENT BLOCK CO., Coraopolis, Pa. $25,000. Martin Bayer.

CONCRETE & CONSTRUCTION CO., INC., Auburn, Wash. $10,000. G. W. Hart, J. N. Shaughnessy and others. To produce sand and gravel and operate concrete-mixing plant.

FRANKLINTON CLAY GRAVEL CO., INC., Franklinton, La.

BUILDING AND ALTERATION PERMITS IN AUGUST, 1931, COMPARED WITH AUGUST, 1930, AND JULY, 1931

State	Aug., 1931	Aug., 1930	July, 1931	State	Aug., 1931	Aug., 1930	July, 1931
Alabama	208,315	531,505	357,625	Nebraska	880,648	968,507	1,048,649
Arizona	120,693	351,311	246,670	Nevada	103,060	248,575	99,050
Arkansas	74,822	334,546	191,808	New Hampshire	111,870	57,236	37,005
California	9,369,102	16,658,564	10,494,160	New Jersey	4,706,601	4,419,387	5,384,280
Colorado	850,745	635,198	501,975	New Mexico	52,909	132,034	264,070
Connecticut	2,716,485	8,563,277	2,863,044	New York	38,001,785	37,415,499	26,355,775
Delaware	108,828	399,727	20,464	North Carolina	519,148	609,477	436,440
District of Columbia	3,375,650	2,396,620	2,303,115	North Dakota	113,799	192,547	117,095
Florida	1,042,347	1,554,398	1,383,876	Ohio	6,987,135	10,803,060	3,924,203
Georgia	425,407	602,521	504,086	Oklahoma	1,501,239	2,563,243	1,665,014
Idaho	54,686	169,536	55,353	Oregon	625,016	1,227,932	1,058,700
Illinois	4,830,616	11,835,198	5,303,427	Pennsylvania	4,792,473	10,816,406	15,009,684
Indiana	1,693,129	2,686,669	1,566,146	Rhode Island	653,155	1,156,022	1,665,520
Iowa	1,540,553	1,318,540	864,138	South Carolina	160,297	239,858	493,255
Kansas	751,845	426,833	428,836	South Dakota	143,740	94,415	8,594
Kentucky	230,935	703,915	435,600	Tennessee	768,838	1,417,349	634,664
Louisiana	911,431	711,590	363,584	Texas	2,983,510	6,882,412	3,252,563
Maine	65,529	89,075	99,399	Utah	189,560	315,270	281,963
Maryland	993,275	2,446,484	5,189,267	Virginia	800,944	1,538,304	723,301
Massachusetts	6,055,911	6,520,064	7,395,125	Washington	1,145,548	2,570,736	2,981,143
Michigan	1,967,247	7,396,459	2,339,625	West Virginia	65,810	445,176	157,578
Minnesota	1,458,192	1,754,616	1,748,526	Wisconsin	4,076,361	3,255,003	2,024,053
Mississippi	31,527	172,324	48,201	Wyoming	110,936	21,631	.....
Missouri	1,560,648	1,631,186	1,587,459				
Montana	317,610	302,185	51,835	Grand Totals	$110,078,954	$157,560,389	$113,957,349

New Machinery and Supplies

Introduces New Tractor Employing Diesel Power

A Caterpillar Diesel Sixty tractor is the Caterpillar Tractor Company's answer to a plea for a Caterpillar tractor plus the ability to operate on Diesel fuels. A carefully studied answer, unhasty—it follows years of experiment, development, tests under varied conditions and with many different fuels.

Caterpillar-designed and Caterpillar-built, the Diesel engine has been developed as a power plant for the Sixty tractor. Power, traction, transmission, frame—all are coördinated in correct balance. In accomplishing this, certain changes in the design of various parts other than the engine have also been made. Frame side members of the Diesel Sixty differ from the Standard Sixty. Radiator design is modified. A heavy equalizer spring is used instead of an equalizer bar. Tracks are of 34 sections; recoil springs are tandem type.

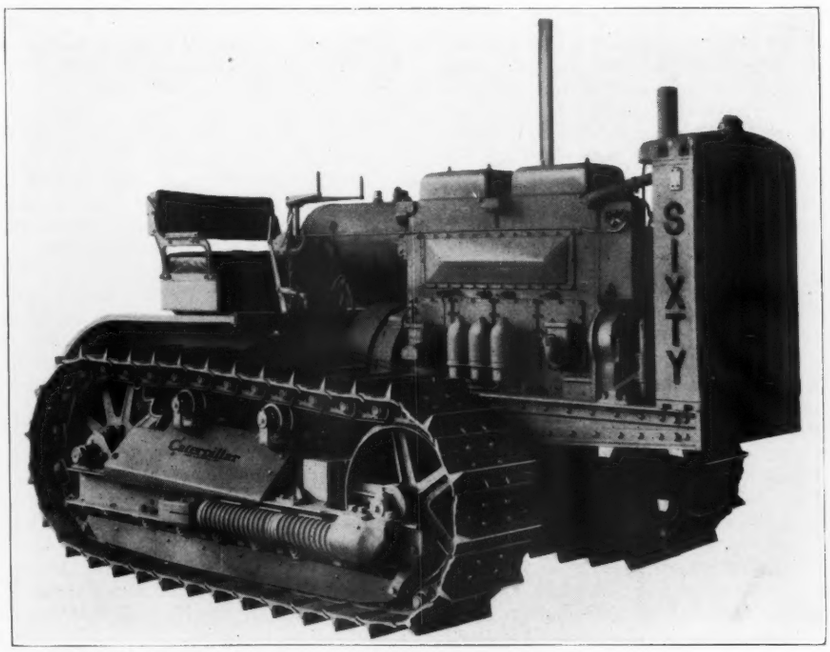
In the Caterpillar Diesel Sixty the fuel injection apparatus is Bosch equipment, adapted to Caterpillar requirements. An important contribution by Caterpillar Tractor Co. in the building of this engine and its presentation to the public is the introduction of sealed fuel injection apparatus. Supplied with each tractor is an extra set of fuel pumps and nozzles—adjusted, sealed and interchangeable as units—avoiding any necessity for field adjustments to the fuel injection system. Should a fuel pump or nozzle ever require adjustment in the field, one of these units may be quickly substituted and the troublesome one returned to the Caterpillar Tractor Co. for servicing.

The Diesel Sixty develops sixty-three maximum drawbar horsepower and seventy-five maximum belt horsepower. Its shipping weight is approximately 25,000 lb.

The Diesel engine is started by a small two-cylinder Caterpillar engine, compactly mounted on the left side of the main power unit. The starting engine is cranked by an easily accessible crank—it operates on gasoline or other high-volatility fuel—connection to the main power plant is automatically disengaged when operating speed is reached.

The Caterpillar Diesel engine uses any oil commonly merchandised as Diesel oil, normally sold in the United States at prices one-third to one-half the price of standard automotive gasoline. Fuel consumption, moreover, is thirty to forty per cent. lower than that of an equivalent-powered gasoline-burning engine.

The Diesel Sixty tractor is the only Diesel-powered model in the Caterpillar line—it is an addition to the line and does not displace the standard Sixty, powered by gasoline engine.



The new Diesel-powered tractor.

New Storage Battery Is Rated at 675 Amp. Hours

To meet the increasing demand for large capacity cells, the Edison Storage Battery Co., Orange, N. J., has added to its list of cells in regular production a new series known as the "C" type. They are manufactured in five different ampere hour capacities ranging from 337.5 ampere hours to 675 ampere hours.

These cells vary in their manufacture from the "A" type cells only in the fact that each positive and negative plate is approximately 50 per cent. higher than the "A" type positive and negative plate.

When assembled in trays they occupy the same square area of battery compartment floor space as the corresponding "A" type cells containing the same number of positive plates. Thus a "C8" cell rated at 450 ampere hours occupies the same square area of battery compartment floor space as does the "A8" cell rated at 300 ampere hours. The height dimension of the "C" type cell is approximately 6 in. greater than the "A" type.

In all "C" type cells the Edison Storage Battery Co. offers the user of battery equipment in industrial truck and tractor service and locomotive service, batteries, which have an increase of 50 per cent. in rated ampere hour and watt hour capacity with no increase in square area of battery compartment floor space required. Thus without impairing the flexibility of a vehicle for use in narrow aisles, small elevators, restricted mine entries and shafts, it is possible to give the vehicle a 50 per cent. increase in working capacity on one charge of the battery. This factor is decidedly important where the vehicle is called upon to operate continuously over long shifts, the added battery capacity often making it unnecessary to bring the vehicle to the charging station for boost charges or battery changes.

The Edison all-steel construction not only gives these large capacity batteries ruggedness, durability and long life but also the additional advantage in transportation services of light weight. Because of this light weight, the Edison battery requires less of its stored energy in hauling its own weight in motive power service than do other makes of batteries. Also because of this light weight the vehicle in which it is mounted requires less maintenance in such wearing parts as tires, bearings, etc.

Thermal Overload Relay on Manual-Type Starter

Cutler-Hammer, Inc., Milwaukee, Wis., announces the redesign of their Bulletin 9115 three- and four-pole types, across-the-line manual starters, to incorporate thermal overload relays in place of the thermal overload cutouts formerly supplied.

The overload relay provides many features which were not obtainable

Starter with overload relay.

with the thermal cutout. Should an overload occur which may be dangerous to the motor, the overload relay trips, opening two lines to the motor so that the entire circuit is opened—the motor cannot continue to run on single phase. When tripped, there is nothing to renew—simply returning the operating handle to the full "off" position resets the overload relay and the motor can then be restarted. This eliminates time taken to renew the fusible clips of the old cutout—allows padlocking the enclosing case to prevent tampering. A trip indicator in the cover of the enclosing case shows at a glance whether the overload relay has been tripped.

The new Bulletin 9115 starter also has a redesigned cover interlock which prevents opening the enclosing case when the motor is running and allows padlocking the operating lever and the enclosing case cover in the "off" position.

Wearing Blades in Log Washer Are Renewable

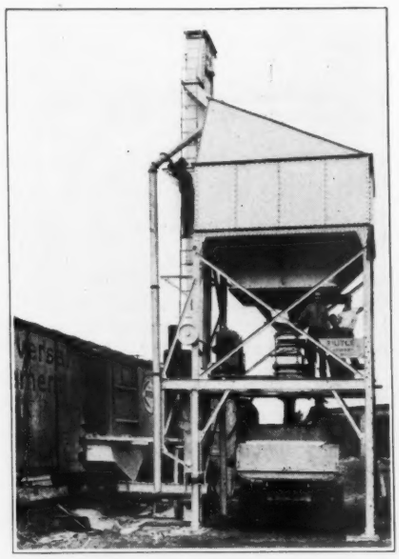
The accompanying illustration shows one of the paddle shafts before it was assembled in a recently-built Stephens-Adamson log washer. Malleable castings cored for a $3\frac{1}{16}$-in. square shaft are used. Each casting has two lugs to which are bolted renewable wearing paddles. As they wear down, these wearing paddles can be renewed without taking down the washer. In this case the log washer consisted of two logs, 17 in. in diameter and 13 ft. long, revolving in opposite directions.

Log washer with renewable blades.

Bulk Cement Handled by Complete Portable Unit

A bulk-cement plant, a complete portable unit consisting of an elevator, power shovel, storage bin and weighing batcher has been designed and is being marketed by the Butler Bin Co. of Waukesha, Wis.

The accompanying illustration shows one of the plants as set up at Elkhart, Ind. A car-door hopper and screw conveyor take the cement as it comes from the car to an inclosed bucket elevator which raises it to the storage bin. An overflow spout prevents clogging of the elevator when the bin is full. The cement-weighing hopper below the bin can be supplied either manually-operated or with automatic weighing for loading into the waiting trucks.



Plant for handling bulk cement.

A 15-hp. LeRoi gasoline engine supplies power to operate the equipment.

Yugoslavia's Cement Industry Second Largest in Value of Exports

A FORTUNATE combination of location, distribution, and demand has been responsible for the development of the Yugoslav cement industry. Except for a period of readjustment—not yet completed—to the realignment of the industrial structure when the Kingdom of Yugoslavia was formed, the industry has been remarkably free from obstructive factors. It has grown steadily since 1869, when the first Portland-cement plant was established on the site of the present works at Beocin, north of Belgrade. Development progressed under the Austro-Hungarian régime, and it was not until the present world depression that it had its first real setback. It remains the country's second export industry, and 1930 shipments of Portland cement came to 2,443,289 bbl.

Marl, the raw material for the domestic industry, is widespread throughout Yugoslavia, many of the deposits being found near the Adriatic coast. Five of the country's 12 cement plants are located on the coast, and naturally produce cement for exportation almost exclusively. This location has another advantage in the easier receipt of coal, which is not available within the country in large enough quantity. The others manufacture largely for domestic consumption. Total capacity of the 12 mills has been estimated at 5,860,000 bbl. a year.

Yugoslav exports of cement have grown steadily from 400,000 bbl. in 1920 to 2,690,000 in 1929, but in 1930 they decreased to 2,443,000 bbl. A large part of the 1930 shipments was to fill orders received earlier, so that it appears likely that later figures will show a still more decided drop. During the first six months of 1931 exports were 1,199,687 bbl.; twice this amount, 2,399,374 bbl., would be close to the 1930 record, but it is probable that the 1931 total will be much below, because shipments in the spring are usually much larger than those later in the year.

Yugoslav exports of Portland cement go to nearly all of the markets of the world, although the greater part is shipped to countries of North Africa and the Near East, easily accessible by sea from Split, the best developed port of Yugoslavia. Shipments to the United States are unimportant. The 2,443,289 bbl. of cement shipped in 1930 included 467,094 bbl. to Egypt, 293,800 to Greece, 268,406 to Syria, 204,055 to the Canary Islands, and most of the remainder went to countries on the Mediterranean.

In 1928, the latest year for which production figures are available, the five coastal cement factories furnished considerably over half the cement production of Yugoslavia. The largest of the inland plants, located at Beocin, has a capacity of 1,750,000 bbl. a year. Two other mills are affiliated with the Beocin plant, and a majority of the shares of a fourth are owned in this same group. Before the war the plants near Beocin supplied cement to Austria and Hungary, to which the area then belonged. Loss of this market and the inclusion of the Adriatic factories within the Yugoslav boundaries caused a great decline in the sales of these plants.

As a result of the necessity for immediate readjustment, the Beocin companies reduced production from 1,750,000 bbl. of cement a year to 39,000 bbl. Two years ago its output was 48,000 bbl. This firm still remains, however, the largest Yugoslav producer of cement. Many efforts have been made to systematize operations and to reduce production costs, which did not keep pace with the drop of 15 to 20 per cent. in cement prices. The factory abandoned production of "Romano" cement and, in addition to its regular production of Portland, commenced output of a quick-hardening cement, which brings about 20 per cent. higher price on the domestic market. The Beocin company and its subsidiaries have now organized to sell to the entire country.

One of the larger plants of the Adriatic group was recently compelled to suspend operations temporarily and shut down its quarries, on account of the prevailing depression. However, this company, the Dalmatia, has recently undergone a complete technical reorganization, so that it is now an entirely modernized factory. All of the Adriatic factories have recently commenced to concentrate on production of better qualities. The raw material used in this area is of quality that allows production of the best grades of cement, with the advantage of setting rapidly and being particularly satisfactory for construction in or near water.

The Dalmatian marl quarries participate directly in export business also, and a considerable quantity of marl is shipped every year. This trade has shown a steady growth, until the tonnage of marl shipped nearly equals that of the prepared cement, the value being, of course, much lower. In 1920 Yugoslavia shipped 8,000 metric tons of marl, this movement rising to 382,000 tons in 1929 and 386,000 in 1930.

In spite of the excellent location of the Adriatic coast plants with respect to exportation, complaint is occasionally made that the Adriatic Sea is a "blind alley" for cement trade. It is claimed that cement exporters along this coast, exporting to 52 markets, are in a less favorable position than that of Belgium, the largest cement exporter. The Adriatic shippers state that they frequently find themselves blocked by the privilege arrangements of the colonial possessions of the various major European industrial countries, and in addition the Yugoslavs claim that their own merchant marine is insufficient to handle this trade.

It does not appear, however, that the present situation need be considered other than temporary for the Yugoslav cement industry as a whole. In spite of the depression, the local industry has made extensive technical improvements—if not complete renovations—and is in a better position to meet the upswing of the demand when it does come. There is also the trend toward production and export of finer grades of cement. It may be that some internal adjustment may still be necessary to adapt the industry to effective distribution in the domestic market, but it appears certain that a revival of export demand will react favorably on the domestic trade.

Caterpillar Announces Cash Price Reduction

Cash buyers of Caterpillar machines will benefit by the newly announced policy of Caterpillar Tractor Co. of allowing a 2 per cent. cash discount from its published factory list prices.

Caterpillar dealers and the company itself have not heretofore discriminated between the cash buyer and the time buyer of its machines but this action on the part of the company will enable its dealers to give just recognition to those possessing cash purchasing power without at the same time penalizing the time buyer.

APPROXIMATE CONSUMPTION OF LIMING MATERIALS ON UNITED STATES FARMS DURING 1930 (*ton basis*)

Compiled by National Lime Association

State	Ground Limestone	Limestone Screenings	Burned Lime	Hydrated Lime	Marl	Miscellaneous Materials[5]	Total Liming Materials	Effective Lime Oxides[6]	Lb. of Lime Oxides per Acre of Cropped Land
[2] Maine	1,500			5,764		1,500	8,764	5,535	6.6
[1] New Hampshire	5,000			500			5,500	2,850	10.5
[3] Vermont	6,028		1,110	130			7,268	4,049	7.0
[4] Massachusetts	30,315			18,034		7,987	56,336	31,876	93.0
[3] Rhode Island	381			825		70	1,276	804	21.1
[1] Connecticut	25,000			2,500			27,500	14,250	53.4
NEW ENGLAND	68,224		1,110	27,753		9,557	106,644	59,364	25.6
[4] New York	162,810		3,450	25,390			191,650	102,111	22.5
[4] New Jersey	12,280		1,890	43,652		471	58,293	38,538	68.4
[4] Pennsylvania	116,202		27,395	87,783	1,935	8,960	242,275	148,283	35.2
[4] Delaware	455	154	3,808	12,095	50		16,562	12,010	46.4
[4] Maryland	2,040	600	10,222	22,348	734	105	36,049	25,881	23.2
[4] West Virginia	6,500		375	1,400	1,748		10,023	5,422	5.6
MID-ATLANTIC	300,287	754	47,140	192,668	4,467	9,536	554,852	332,245	28.5
[4] Ohio	192,341			25,030		15,549	232,920	121,465	20.8
[3] Indiana	151,933			2,204	10,640		164,777	82,830	13.8
[3] Illinois		750,000					750,000	262,500	24.6
[3] Kentucky	260,000		4,000		30,000		294,000	143,900	42.1
[3] Michigan	27,594	63,495		9,895	25,000	10,000	135,984	56,697	11.7
[4] Minnesota	10,000	4,850			1,000	1,600	17,450	7,848	0.8
[3] Iowa		300,000				50,000	350,000	130,000	11.8
[3] Kansas	37,125	1,900					39,025	19,228	1.6
[3] Missouri	228,404						228,404	114,202	14.9
MID-WESTERN	907,397	1,120,245	4,000	37,129	66,640	77,149	2,212,560	933,670	13.3
[1] Virginia	71,250	9,500	23,750	9,500			114,000	65,788	24.5
[2] North Carolina	98,800		1,000	200			100,000	50,390	14.7
[2] South Carolina	12,000						12,000	6,000	2.4
[2] Georgia	5,000		35	50			5,085	2,565	0.5
[2] Florida	1,500		500	1,500			3,500	2,225	2.2
[2] Tennessee	332,500						332,500	166,250	43.8
[2] Alabama	10,615		65	20			10,700	5,377	1.4
[2] Mississippi	8,000			2,000			10,000	5,400	1.6
[2] Arkansas	5,000						5,000	2,500	0.7
SOUTHERN	544,665	9,500	25,350	13,270			592 785	306,495	10.3
[4] California	2,569			2,255	10,079	6,252	21,155	9,518	2.3
[1] Oregon	2,000						2,000	1,000	0.5
[1] Washington	4,000	3,000	300	1,000			8,300	4,005	1.3
WESTERN	8,569	3,000	300	3,255	10,079	6,252	31,455	14,523	1.5
GRAND TOTALS	1,829,142	1,133,499	77,900	274,075	81,186	102,494	3,498,296	1,651,296	

States not listed have no figures available or use little or no liming materials.
[1] Figures estimated by agronomy department at state college.
[2] Figures partially estimated and partially obtained by county agent or produce survey.
[3] Figures obtained by county agent survey.
[4] Figures obtained from producers.
[5] Consists of ground shells, by-product lime, etc.
[6] Computed on the following basis: 35% for limestone screenings and farm-dug marl; 50% for ground limestone, miscellaneous materials and commercial marl; 70% for hydrated lime and 85% for burned or quicklime.

Legal Information for Operators

Compensation Law Held Void if Discriminatory

Any compensation law is void which is discriminatory. So held the higher court in the recent case of Thomas *v.* Morton Salt Co., 235 N. W. 846.

In this case a state law provides:

"That any minor between the ages of sixteen and eighteen years whose employment at the time of injury shall be shown to be illegal shall receive compensation double that provided elsewhere in this act."

A minor, who was employed in violation to state laws, was killed while attending to his regular duties. His dependents sued to recover double compensation. In holding the above law invalid, this court said:

"We are of the opinion that, in bringing all illegally employed minors within the law, separating them into two classes, and awarding twice as much compensation to one class as to the other, the Legislature has established an illegal classification both as to employers and to minors in contravention of the equal protection clause of the Constitution. . . . . What good reason is there for giving illegally employed minors under sixteen years of age only half as much compensation as those illegally employed minors who are between sixteen and eighteen?"

Fails to Prove Damage Was Caused by Blasting

Generally speaking, a property owner who sues to recover damages alleged to have been caused by blasting operations is bound to prove that the explosion caused the injury upon which suit is based.

For illustration, in Thistlethwaite *v.* Shell, 133 So. 356, a property owner sued to recover $9,455 as damages which he alleged was caused by blasting operations. However, he failed to prove that the cracks in his home were caused by the explosions and the higher court held the person, against whom suit was filed, not liable and said:

"There is no positive testimony that the house was in perfect condition prior to the date of the explosion except that of the plaintiff himself. . . . Plaintiff's house was built approximately two years prior to the explosion, but the plastering job was not first class. The contractor who did the work said it was, but on that point he was contradicted by every other witness who took the stand."

Various courts, however, have held that any person who effects injury to the property or person of another is liable for reasonable damages. The latest case involving this point of the law is J. B. McCrary Co. *v.* Phillips, 130 So. 805.

Here a person who had leased a small and unpretentious home sued to recover damages for injury to the house caused by blasting operations. It was argued that the tenant was not entitled to damages because he did not own the house. However, the higher court held the tenant entitled to a recovery, and said:

"The plaintiff's home, though humble, and founded upon nothing more than a leasehold, was within the protection of the law, and, there being a direct invasion and trespass upon the plaintiff's premises, he was entitled to recover, at least nominal damages for this invasion of his rights, regardless of whether the invasion was the result of negligence or not, and in assessing damages in such a case account may be taken of and compensation allowed for the fright, sense of personal danger, or other mental suffering shown by the evidence to be the proximate and natural consequence of the repeated trespasses committed under such circumstances."

Gravel-Truck Operator Is Denied Compensation

In law an independent contractor is a person who agrees to perform certain work at a specified price or charge under such circumstances that the legal relation of master and servant does not exist. An employer always is liable in damages for injuries negligently affected an employee where the relation of master and servant exists, but the employer never is liable under circumstances where the employee is a legal independent contractor. The latest higher court case involving this point of the law is Maryland Casualty Co. *v.* State Industrial Commission, 298 Pac. 275.

The facts of this case are that the owner of a quarry employed the owner of a truck to haul stone from the crusher and agreed to pay 60 cents a yard for such services. The employer directed the truck driver where to go for the stone, where to take it, and required him to work whenever the crusher was running.

While performing his work the truck owner was seriously injured. He sued the employer to recover compensation on the grounds that the relation of master and servant existed. However, in view of the evidence which disclosed that the truck owner was privileged to substitute an employee to perform the work, the higher court held the employer not liable, and said:

"It is a question of law whether the relation be that of employer and employee or independent contractor. In this case we think the uncontradicted evidence shows conclusively that the claimant (employee) at the time he received the injury was an independent contractor and not an employee."

Also, in another leading higher court case, Southern Co. *v.* State Industrial Commission, 240 P. 613, it was shown that a company employed a truck owner to deliver gravel on a road-construction job for 20 cents per ton per mile as his compensation. The truck owner was at liberty to drive the truck or employ any one under his control and direction to perform the same service in delivering the gravel. While performing the work the owner of the truck sustained a severe injury. He sued his employer to recover damages. Under the circumstances the court held the truck owner to be an independent contractor and thereby relieved the employer from liability for the injury.

Employer Must Furnish Safe Tools for Workers

It is well-established law that an employer may be liable in damages for negligence in failing to supply employees with reasonably safe tools, where it is shown that the employee was injured as a result of this negligence. However, the law expects workmen to exercise due diligence and care to prevent injuries to themselves and failure to exercise this degree of care relieves the employer from liability.

For example, in Mosley *v.* Raines, 37 S. W. (2d) 78, it was disclosed that an employee was seriously injured while he with other workmen were attempting to break a slab of rock by ramming a piece of rail of considerable length against it. The employee sued the employer for damages, contending that the injury resulted from the latter's failure to provide suitable tools and a safe working place. However, under the circumstances that an ordinarily careful employee should have realized the danger associated with attempting to break the slab by use of a rail, the court held that he had failed to exercise reasonable care to prevent injury to himself. Therefore, the court held the employer not liable, and said:

"The master owes the servant the duty to exercise reasonable care in furnishing a safe place to work and safe tools and appliances. . . . . The master is not only bound to exercise reasonable care to furnish a safe place to work, but the servant has a right to assume that the master has performed his duty. It is, however, also thoroughly established by the decisions of this court that the master is presumed to have performed his duty, and the servant can not recover for an injury unless he shows that the master was guilty of negligence and that the negligence of the master caused his injury."

ONE PUMP - - - - does the work of two - - SAVES $12,500.00

ON a certain job in the Mississippi River, a dredging company has one ordinary dredge pump, capable of 125 cubic yards of fill per hour at 100′ head, the pump being driven by a 550 H. P. motor. The requirements of the fill demanded 200 additional foot of pumping head, which would ordinarily mean the installation of two booster pumps. They investigated the Hydroseal Pump and found that with one pump, driven by a 500 H. P. motor, they could obtain the required additional head with the same pumping capacity.

By using the Hydroseal Pump they save 50 H. P. on one pump and 550 H. P. on the second booster pump or 600 H. P. per hour. At 1c per hour per H. P., the saving is $6.00 plus $1.25 per hour for an attendant at the second booster or a total of $7.25 per hour. Their contract covers 250,000 cubic yards of fill, and since they save $7.25 for every 125 yards of fill, they save over 5c per cubic yard or a total of $12,500.00 on the job. Aside from this, they save the cost of a second booster pump, a 550 H. P. motor and about 2500 feet of electric cable, which would have been necessary therefor.

Write us for the name of the dredging company making this saving, a list of Hydroseal Pump installations and our Catalog 331. The Allen Sherman Hoff Co., 215 So. 15th St., Philadelphia.

HYDRO SEAL